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ABSTRACT

An adult farmer course designed to develop the effective ability of land holders to plan for and implement wise land use is presented. The unit consists of eight lesson plans: (1) the importance of land use, (2) the physical and chemical properties of the soil, (3) soil testing as a tool of land use, (4) balanced fertilization of soils, (5) selection of productive crop and/or livestock programs based on wise land use, (6) soil and water conservation, (7) soil and water management for rural use, and (8) soil water management for urban use. Masters for transparencies are included for each lesson. In addition, a teaching plan for the course and other planning forms are appended. (VA)

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Land Use

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An Instructional Unit for Teachers of Adult Vocational Education in Agriculture

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1973

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FOREWORD

Mr. Jack Wise, teacher of vocational agriculture at George Rogers Clark High School, brings to this publication eight years of experience acquired in teaching young farmers in Bracken and Clark Counties. He holds the B.S. and M.S. degrees from the University of Kentucky and is active in numerous civic and educational activities.

This adult-farmer course is a result of the following sequence of actions:

1) The State Advisory Committee, made up of agriculture teachers, State staff, and teacher educators from throughout Kentucky, was organized to determine needs and program direction for adult work in agriculture for the State. A major outcome of the first meeting in September, 1971, was a recommendation that more instructional materials that are specifically designed for teaching adults in agriculture be developed and distributed to teachers.

2) Subsequently, a proposal to involve experienced teachers of adults in material development was written by Dr. Maynard Iverson of the University of Kentucky and submitted for State funding. In January, 1972, a two-year special grant was made through the Supporting Services Division, Bureau of Vocational Education, State Department of Education.

3) Twelve teachers were selected to produce units in the diverse areas of need during the course of the project.

This publication, along with other materials developed specifically for instruction of adults employed in agriculture in Kentucky, should improve the teaching of adult classes in agriculture and stimulate the initiation of additional classes.

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We are grateful to the following for their valuable assistance with the unit: Mr. Jim Childers, Mr. Harold Woodlee and Mr. Billy Adams of the Clark County Soil Conservation Service; Mr. W. W. Thorn, Chairman, Clark County Soil and Water Conservation District; Mr. David Moss, President of the Jr. Board, Soil and Water Conservation District; Mr. Gene Megli and Mr. Huston McQuerry, Clark County Extension agents; Mr. John A. Rose, Mr. Lloyd Wells, Mr. Don Bowen and Mr. Fred Farris, Officers of Clark County Chapter of The Kentucky Young Farmers Association; Mrs. Kay Sloan, MDTA Instructor and Mrs. Joyce Huang, MDTA student; Mr. Douglas White, Contractor, Winchester; Mr. Dave Wagner, Forester, Daniel Boone National Forrest; Mr. William Quisenberry, Manager, Royster Fertilizer Co.; Mr. Eddie Gilkerson, Farm Consultant, East Ky. RECC; Mr. Charles Stevenson, Owner, Winchester Tractor Sales; Miss Jackie Lee Wise, Miss Linda Ledford, Miss Carol Ledford, and Miss Susan Roberts, Typists; Mrs. Anne Mills, Secretary, Department of Vocational Education, U of K; Mr. Ray Gilmore, Artist, Curriculum Development Center, U of K; and especially Dr. Kenneth Wells, Extension Soils Specialist, and Dr. Frank Pattie, Professor Emeritus, University of Kentucky, for their critical reviews of the manuscript; and the many authors and agencies whose publications were utilized in developing the unit.

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SUGGESTIONS FOR USING THE COURSE

This unit was developed as a guide for use by teachers in planning and conducting young farmer and/or adult farmer classes. Because of the diversity in age, expertise and experience levels of class members and instructors, the unit was designed to cover the basic areas of land use. Therefore, teachers should adapt those portions of the unit that are suited to their particular situation. Eight lessons have been included, but the unit may be expanded to more topics or utilized in diversified courses for shorter periods of instruction. It may be helpful to involve class members at the organizational meeting in the selection of lessons and activities. Planning forms to assist in this process are found in the appendix. We highly recommend that the major teacher reference, Profitable Soil Management, be secured by anyone planning to utilize this unit.

The format used was designed to assist teachers in utilizing problem-solving and the discussion method. A teaching procedure that has been used successfully is as follows: Step 1: The teacher lists the topic (problem and analysis) on the chalkboard. Step 2: He then sets the stage for discussion with introductory facts, ideas, or comments, using items from the section on "developing the situation." Step 3: The teacher calls on the class to give their experiences, ideas, and knowledge concerning the subject. The discussion is supplemented with handouts, transparencies, models, or other inputs gathered by the teacher beforehand to help solve the problem under consideration. Resource people or films may also be used here as sources of information. (Transparency and handout masters are found at the end of each lesson in the unit.) Step 4: When the facts have been brought out and a good discussion has taken place, the teacher leads the group to appropriate conclusions. These summary statements are written on the chalkboard and, in some cases, are typed up and distributed as handouts at the next meeting. Some instructors will utilize devices such as panels, exhibits and tours to reinforce the conclusions reached. Several suggestions for supplementary enrichment activities are listed in each lesson of this unit.

Teachers may want to utilize the wealth of resources found in each community to supplement their teaching -- local Soil Conservation Service personnel, State Forestry Service representatives, and others will undoubtedly be pleased to serve as

resource people, furnish samples, give demonstrations, conduct tours, arrange for films and assist with other activities appropriate to the success of the course.

Each teacher using the unit is asked to complete and return the evaluation questionnaire found in the appendix. These ratings and suggestions will be used to improve this unit as well as others developed in the future.

Our best wishes for a successful adult program.

Jack Wise
Development Consultant

Maynard J. Iverson
Project Director

OBJECTIVES

Major objective:

To develop the effective ability of land holders to plan for and implement wise land use.

Lesson objectives:

To develop the effective ability of land holders to:

1. Understand the importance of land use.
2. Understand the physical and chemical features of soil.
3. Utilize soil testing as a tool of land use.
4. Balance fertilization of our soils.
5. Select crop and/or livestock programs based on wise land use.
6. Understand soil and water conservation.
7. Manage our soil and water for rural use.
8. Manage our soil and water for urban use.

UNIT REFERENCES

Books

Farm Management Principles, Budgets, Plans by Herbst, Stipes Publishing Co., Champaign, Ill., 1970.

Farm Soils by Edmund Worthen & Samuel Aldrich (John Whiley and Sons, New York), 1948.

Land, USDA--Yearbook of Agriculture, 1958

Land Resources Economics by Barlowe)Prentice Hall) 1958.

Our Soils and their Management by Donahue (Interstate Printers and Publishers, Inc., Danville, Ill.) 1961.

Profitable Soil Management by Leo Knuti, Milton Karpi, J. C. Hide (Prentice Hall Inc., Englewood Cliffs, N. J.) 1970.

Soil, USDA--Yearbook of Agriculture, 1957

The Farm Management Handbook by Hall and Mortenson, (Interstate Printers and Publishers, Inc., Danville, Ill.) 1961.

Using Commercial Fertilizers by McVickar (Interstate) 1966.

Water, USDA--Yearbook of Agriculture, 1955

U. S. Government Publications

Conservation and the Water Cycle, Ag. Infor. Bulletin 326.

Conservation goes to Town, Reprint, USDA - SCS.

Controlling Erosion on Construction Sites, Bulletin 347.

Know the Soil You Build On, Bulletin 320.

1972 Handbook of Agriculture Charts, Agriculture Handbook No. 439.

Soil and Water Conservation in Suburbia, Reprint, USDA - SCS.

Soil Conservation at Home, Bulletin 244.

Teaching Soil and Water Conservation, PA 341.

U. S. Department of Agriculture (U. S. Government Printing office, Washington, D. C.)

Water Intake by Soil, USDA, Mis. 925.

Cooperative Extension Publications

Controlling Soil Acidity, UK Circular 584.

How to Take Good Soil Samples, UK Leaflet 139.

Lime and Fertilizer Recommendations Guide, UK Circular 619.

Proceedings, 3rd Ky. Grasslands Conference, 1972, UK.

Soils Handbook, UK Misc. 383.

When to Apply Lime and Fertilizer by Kenneth Wells, UK Agr. 5.

Other Publications

Improving Land Use, Adult Farmer Course, UK, 1960.

National Land Use Policy, (Soil Conservation Society of America, 7515 N. E. Ankeny Rd. - Ankeny, Iowa), cost, $3.50.

Soil and Water Conservation, Ohio State University, DEX 936.

The New Guide to Soil Fertility and Livestock Profits, (Royster Co., P. O. Drawer 1940, Norfolk, VA 23501)

Magazines

"Better Crops with Plant Food," Plant Food Review, Spring, 1972.

Crops and Soils Magazine, April, May, June, and July. 1973.

"The case for plant tissue analysis", Reprint from Fertilizer Solution.

Films (Available for loan from the Division of Conservation, Frankfort, Kentucky)

"Altered Environment"

"Citizen Makes a Decision"

"Clean Waters"

"Conserving Our Forests Today"

"Conserving Our Soil Today"

"Ecology of Cultivated Areas"

"Environment"

"For Years to Come"

"Know Your Land"

"Let the Little Lake Live"

"Living Earth Series"

"Man's Effect on the Environment"

"Man Uses and Changes the Land"

"Mud"

"Planning to Prosper"

"Raindrops and Soil Erosion"

"Soil Conservation"

"The People Together"

"The Soil is Good"

"Topsoil"

"Urban Sprawl vs. Planned Growth"

"Valley of Still Waters"

"Yours is the Land"

INTRODUCTORY MATERIAL

Land use--what is it? Anyone who has even a backyard has to think about land use. Where should the grill go, the picnic table, the clothesline, the lawn, the shrubbery, the trees? These are problems in land use that are common to most of us.

The American pioneers who helped to establish towns, or took up farms in the wilderness, had to settle larger problems in land use. They probably asked these three questions before deciding what to do with the new lands: (1) How can we do it? (2) Will it pay? (3) Will we enjoy the result? Scientists speak of these aspects of land use as technical, economic, and social. In 1938, Henry A. Wallace wrote these words in the Yearbook of Agriculture, Soils and Men:

> The earth is the mother of us all--plants, animals, and men. The phosphorus and calcium of the earth build our skeletons and nervous systems. Everything else our bodies need, except air and sun, comes from the earth.
>
> Nature treats the earth kindly. Man treats her harshly. He overplows the cropland, overgrazes the pastureland, and overcuts the timberland. He destroys millions of acres completely. The flood problem, insofar as it is man-made, is chiefly the result of overplowing, overgrazing, and overcutting of timber. This terrible destructive process is excusable in a young civilization, but it is not excusable in the United States now.
>
> We know what can be done and we are beginning to do it. As individuals, we are beginning to do the necessary things. As a nation, we are beginning to do them. The public is waking up and just in time. In another 30 years it might have been too late.

Thirty-five years later we are still faced with many of these problems as well as with air pollution. Man is a part of a closed life-system and dependent on it for his survival.

The realization of this fact has forced us to ask these questions: Where and how do we want economic and urban growth? How can we adjust our priorities to insure that we fulfill our food and personal consumer needs without intensifying environmental problems we did not anticipate and do not want?

It will not be easy to change our habits, some of which have gone unquestioned for generations. It is up to each one of us to develop a new pattern of land and environmental management. We must become the first generation to work with nature instead of against her.

If we act wisely and with speed, we can elevate the quality of life as well as expand the quantity of goods. We can set an example by turning from exploitation to preservation, from growth at any cost to growth for a purpose.

Lesson 1

THE IMPORTANCE OF LAND USE

Objective -- To develop the effective ability of land holders to understand the importance of land use.

Problem and Analysis -- What is the importance of land use in today's world?

-Meaning of land use
-Our heritage of land
-Current land use
-Future land use

Content

I. Meaning of Land Use

A. A brief look at the world around us reveals a wide panorama of land problems. Two-thirds of the world's people still live in the shadow of want and hunger. This situation calls for development of new agricultural lands and for the most productive use of many areas already in cultivation.

1. Some of these problems center around the individual operator's choice of enterprises, his managerial decisions, and his willingness to bring new areas into use.
2. Land problems are also important in the urban areas, particularly when one interprets these problems to include the structures built upon land as well as the bare land itself. Some of our most important urban land problems concern the succession of land use that takes place with urban growth; the operations of real estate markets; the provision of housing, recreational, rapid-transit, parking, and other facilities; the redevelopment of blighted areas; and plan-

ning for the future growth of our cities. These problems include the expense of providing schools, water and sewerage systems, paved streets, and other public services; the prevention of undesired developments and the need for integrating certain local problems with those of the overall metropolitan community.

3. Land use may be described as the relationship between man and land. Stated in more detail, it may be defined as the area that deals with man's ability to use the surface resources of the earth and with the physical and biological, economic, and institutional factors that affect, condition, and control his use of these resources.

II. Our Heritage of Land

A. Land is many things to many people--to the farmer, a livelihood; to the townspeople, space or place to live and build their homes; to the child, a playground. Land is a vital part of our environment. Land has served us well in the past. It was virtually the only resource available to our ancestors at the end of the Revolutionary War. Proceeds from the sale of land were used to provide funds to launch our fledgling nation. The setting aside of public lands has been particularly helpful in educating the young, for example, the land grant college system. In a larger but immeasurable sense, land may have been responsible for much of our political and economic freedom.

B. Land can make the contribution to our welfare in the future that it has made in the past only if we have full knowledge of its potential capacity and use the land as it should be used.

III. Current Land Use Data From 1967 Provides Us With the Following Information:

A There are 2.5 billion acres of land in the 50 states.

B. One-third is public land.

C. Of the remaining two-thirds, about three percent is urban and three percent is owned by state, county, or local governments; an additional two percent is reserved for American Indians. The remaining 59 percent--some 1.3 billion acres--is privately owned rural land.

D. Private rural land is almost equally divided among three major uses: cropland, pasture and range, and forest land. Commercial forest accounts for about 400 million acres of the total 460 million acres of forest land.

E. Three-fifths of America's private land is not being cared for to the degree that conservationists feel is necessary to protect the soil for sustained use.

F. Sixty-four percent of the nation's cropland needs additional conservation treatment.

G. Sixty-seven percent of the pasture and rangeland and 62 percent of forest land has received inadequate treatment.

H. To illustrate the function of land-use policy: 40 years ago New York had a land policy (1) classifying land, (2) developing the best land as highly as possible, and (3) transferring the poorest land to public ownership and reforesting it.

IV. Future Land Use: Factors Relating to Future Land Use

A. Land use will be more affected by certain basic socioeconomic factors than it will by anything inherent in the land itself.

B. Economic growth will relate to the make-up of the output of goods and services and to the degree or the way in which environmental costs are assessed against that output.

C. The total amount of leisure time will continue to rise, expecially among the young and the old.

D. Planning for land use is certain to increase in

amount, intensity, and skill over the next few decades.

E. Land-use controls may be based on land-use plans, or they may be imposed by bodies who use other kinds of information.

F. Zoning is more a negative than a positive control. It is less effective in rural areas in guiding or restricting land use change.

G. Local government will continue to make land-use plans and to control local use.

H. Environmental controls over land use will grow stiffer and more exacting in the future.

I. Major changes will be made in production processes and in consumption habits.

Suggestions for Teaching the Lesson

I. Developing the Situation

A. Things to be brought out by the teacher:
1. If we have concern for the quality of living for all people and for future generations, sound land use at all levels is a matter that needs attention.
2. Land use can make a contribution in the future as it has in the past.
3. Public and private land use in connection with urban-rural land use.
4. A good, sound land-use program needs to be well planned.
5. Extensive planning must be done on the local level.

B. Things to be brought out by the class members:
1. Their ideas of land-use importance on national, state, and local levels.
2. Experiences and observations of planning in their own city and country areas.
3. Discussion as to decreasing use capacity of land.
4. Types of land-use classification in our country. (See chart.)

5. Pros and cons of federal land-use controls.

II. Conclusions

A. Land use is very important to all people regardless of their place in the world.

B. Land use is just as important on a half acre of land as it is on 2,000 acres of land.

C. It is necessary that sound land-use plans be carried out in our community.

D. The local level should be the source of long-term land-use plans.

III. Enrichment Activities

A. Use individuals from the Forest Service, SCS, or the County Planning Commission to discuss the importance of land use.

B. Have a class member tell others of his good land-use methods.

C. Use films available for loan from the Division of Conservation, Frankfort, Ky.

D. Show slides that you made of changes that we need to make.

IV. Suggested Teaching Materials

A. References for Lesson 1

1. Land Resources Economics, chapters 1 & 2.
2. Land, Yearbook of Agriculture, 1958, pp. 1-62.
3. National Land Use Policy, pp. 1-37.
4. 1972 Handbook of Agricultural Charts.

B. Resource personnel

1. Local SCS personnel
2. Local planning or zoning members
3. State Forestry Service
4. W.W. Thorn--Winchester, Ky., Chairman, Clark SWCD (or local chairman, SWCD).
5. For other specific personnel, see the VoAg Directory of Resource People in Kentucky.

C. Audio-visuals

1. Masters*

-1 Types of Land Use Classification
-2 Profile of Land Use
-3 Major Uses of Land in the U. S., 1954
-4 Land Use in the 50 States, 1969
-5 Major Uses of All Land vs. Total Land Area by Regions
-6 Major Land Use by Continents
-7 Changes in Land Use in the U. S.
-8 Land Ownership in the 50 States, 1969
-9 Proportion of Land area in Federal Ownership, 1956
-10 Major Uses of All Land as Compared With Total Land Area, 1954
-11 Principal Vegetative Cover Types on Federal Land
-12 Land Use Worsheet

NOTE: Local and county land use data should be secured by the teachers and made into masters; the SCS, Census or other sources can be used.

2. Films available from Division of Conservation, Frankfort, Ky.

a. "Altered Environments: An Inquiry into American Highways," 10 min. color.
b. "Ecology of Cultivated Areas."
c. "For Years to Come," 22 min. B&W.
d. "Man's Effect on the Environment," 14 min. color.
e. "Man's Uses and Changes of the Land," 11 min. color.

NOTE: Masters are keyed to the unit and lessons, and are numbered consecutively. Master 102-1-1A represents "adult unit 102, lesson 1, item 1, part A."

TYPES OF LAND-USE CLASSIFICATION*

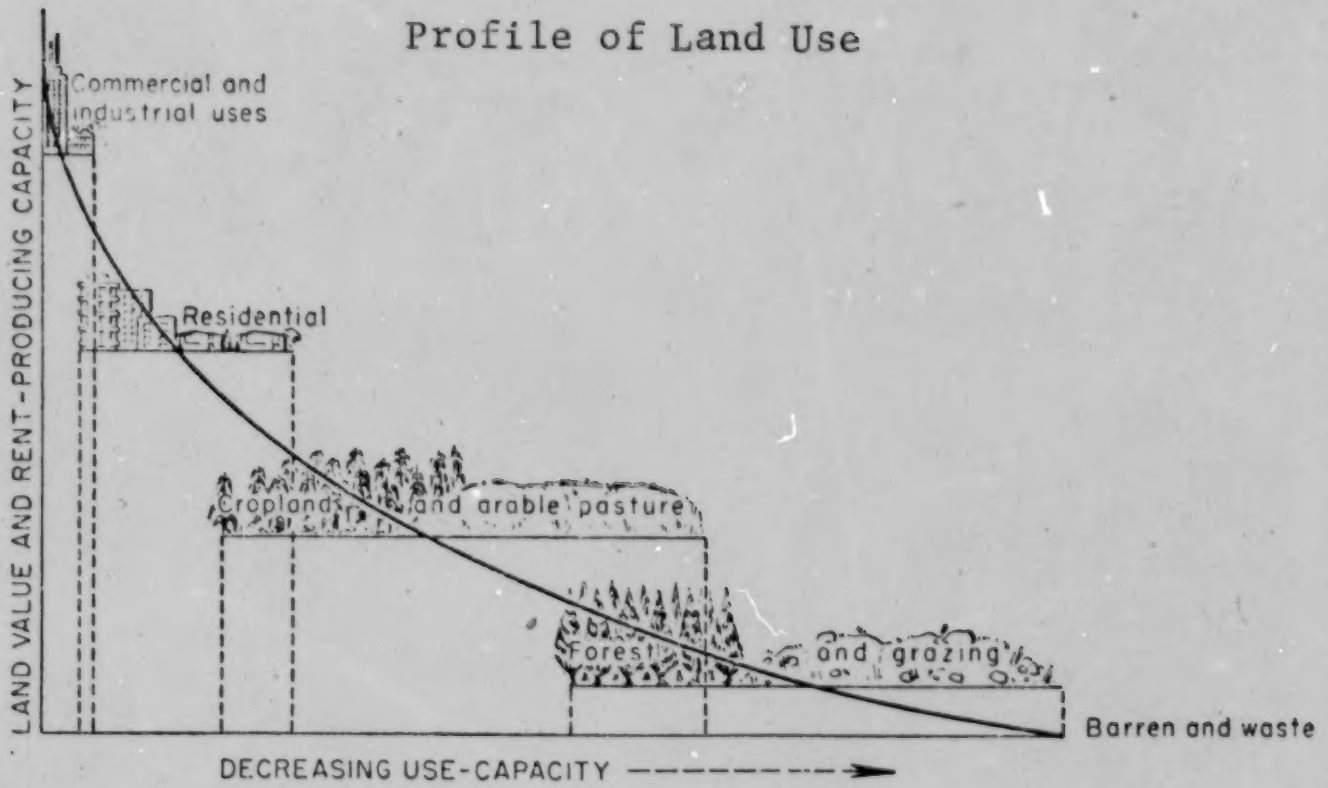
1. Pasture and grazing land
2. Forest land
3. Cropland
4. Mineral land and barren waste
5. Transportation
6. Recreational land
7. Residential land
8. Service areas
9. Commercial and industrial sites

NOTE: Land use capacity is the ability of any given unit of land resource to produce a net return above production costs.

*In order of size in the United States

102-1-1

Profile of Land Use



Generalized profile of land uses showing the overlapping ranges within which selected uses may be regarded as the highest and best use.

MAJOR USES OF LAND IN THE UNITED STATES, 1954

Land Use	*Millions of acres*	*Percentage of total*
Agricultural uses:		
Cropland		
Cropland harvested, summer fallow, and crop failure	380.5	20.0
Unharvested cover and soil building crops, and idle cropland	18.7	1.0
TOTAL	399.2	21.0
Pasture and grazing land		
Cropland used as pasture	66.1	3.4
Farm pasture	459.9	24.1
Nonforested grazing land	173.5	9.1
TOTAL	698.5	36.6
Forest land *		
Pastured farm woodland	121.2	6.4
Grazed forest land	180.1	9.4
Forest land, not grazed	238.3	12.5
Farm woodland, not pastured	75.8	4.0
TOTAL	615.4	32.3
Miscellaneous farm areas		
Farm homesteads and service areas	9.0	0.5
Farm roads and lanes	2.0	0.1
Wasteland included in farms	25.0	1.3
TOTAL	36.0	1.9
Nonagricultural uses:†		
Urban areas	18.6	1.0
Highways, railroad rights-of-way, airports	24.5	1.3
National and state parks	18.7	1.0
Wildlife areas	8.8	.5
National defense areas	21.5	1.1
Other service lands	7.1	.4
Nonfarm wasteland and miscellaneous	55.5	2.9
TOTAL	154.7	8.2
	1,903.8	100.0

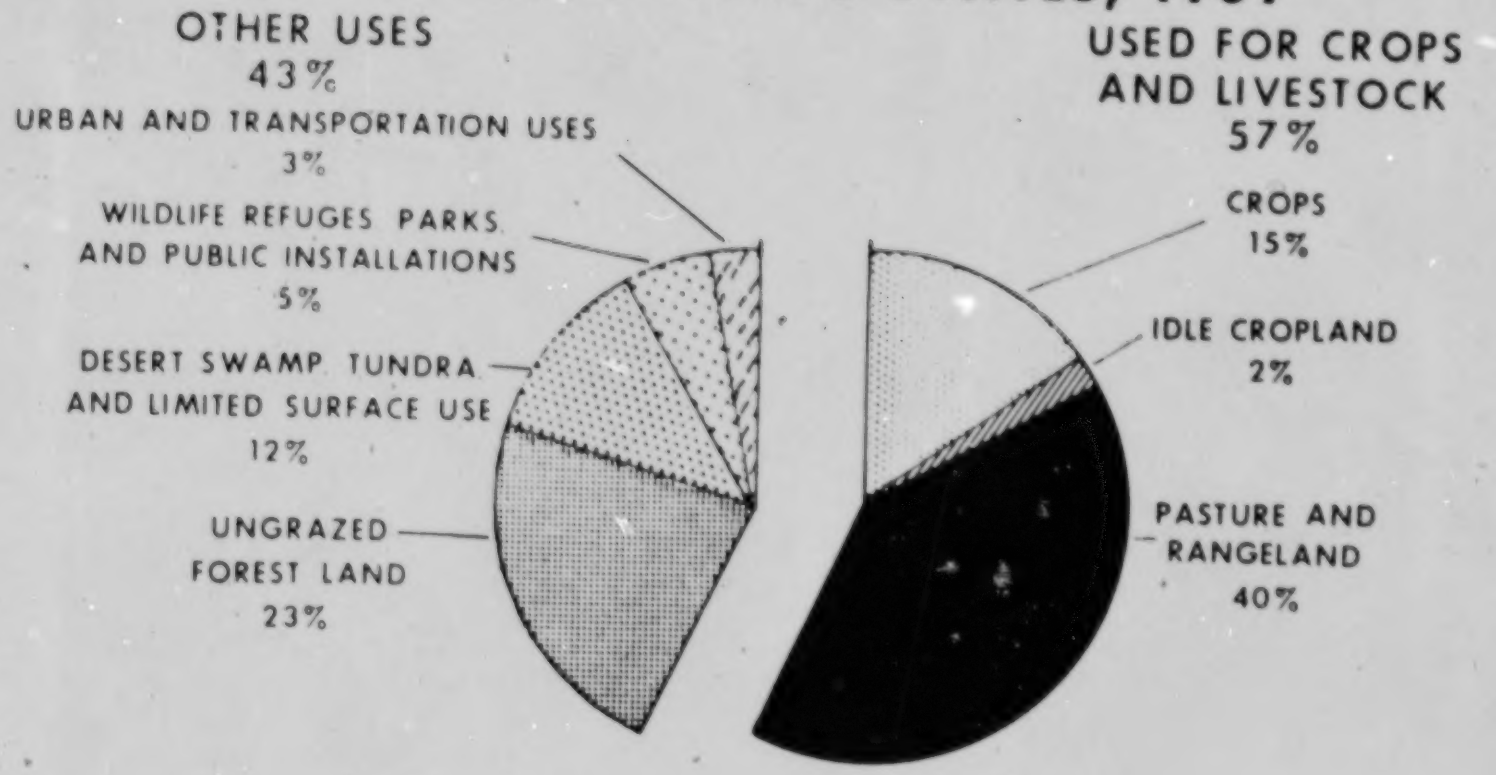
* An additional 26 million acres of forest lands is included in parks, wildlife, and other use areas.

† This classification does not include a considerable area used for unincorporated urban or suburban developments, small villages, rural nonfarm residences, rural industries and roadside businesses, quarries and mines, reservoirs, cemeteries, golf courses, and powerline rights-of-way. (Cf. Table 2-4.)

SOURCE: Compiled from data reported by Hugh H. Wooten and James R. Anderson, *Major Uses of Land in the United States: Summary for 1954*, U.S. Department of Agriculture Information Bulletin 178, 1957.

102-1-3

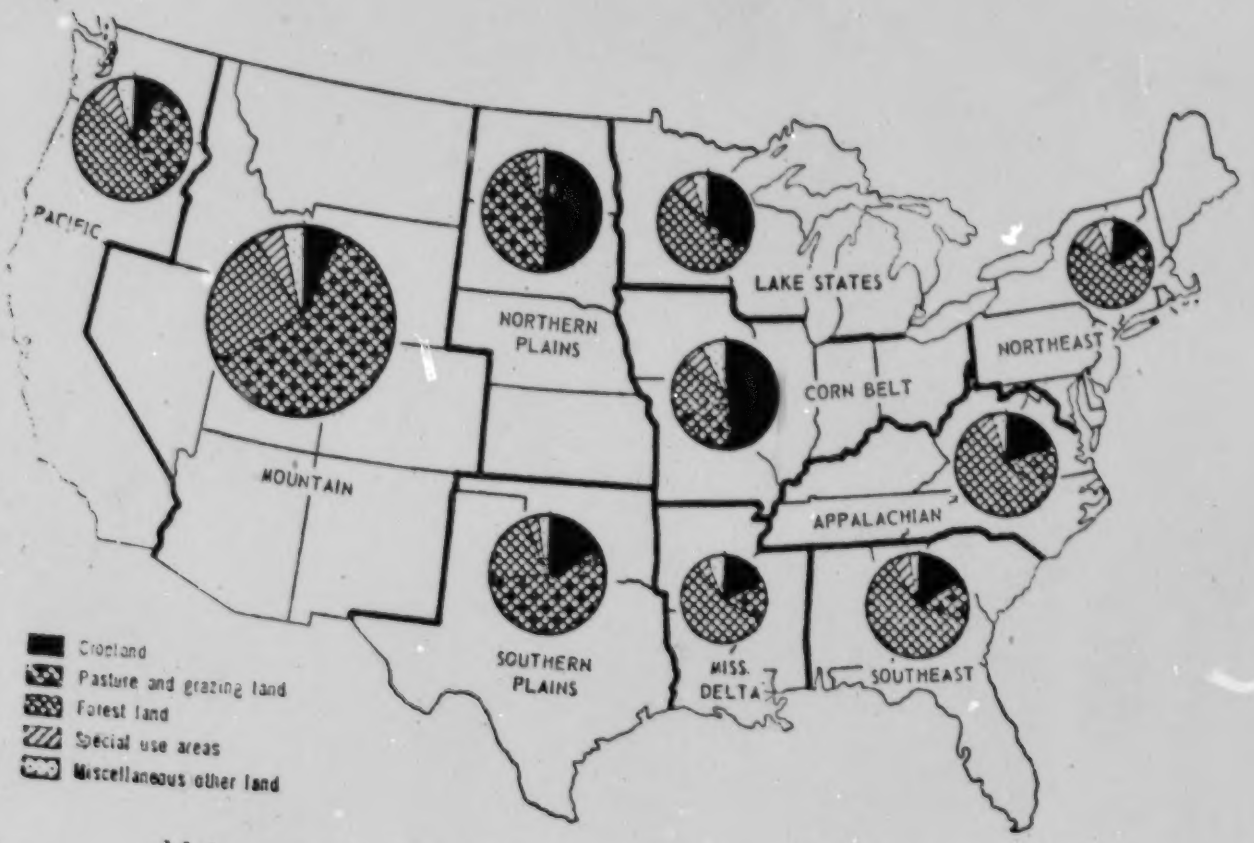
LAND USE IN THE 50 STATES, 1969



TOTAL AREA 2.3 BIL. ACRES

U.S.

102-1-4



Major uses of all land as compared with total land area by regions, 1954.
(*Courtesy U.S.D.A.*)

1C2-1-5

Major Land Uses by Continents and Selected Nations

Area	*Total area* †	*Arable cropland*	*Meadows and pasture*	*Forest land*	*Unused but potentially productive*	*Built upon, wasteland, and other*
	(millions of acres)			(percentages)		
World total	33,477.1	9.7	17.3	28.5	3.2	41.3
Continents						
Europe*	1,218.2	30.5	19.9	25.8	2.0	21.8
North America	5,989.7	10.6	15.8	31.1	3.9	38.6
South America	4,393.4	3.8	17.3	40.3	3.9	34.7
Asia *	6,780.4	12.7	15.8	18.2	4.2	49.1
Africa	7,479.7	8.1	20.6	25.1	4.3	41.9
Oceania	2,112.7	2.5	44.0	7.6	0.8	45.1
U.S.S.R.*	5,502.9	10.1	5.6	41.3	0.5	42.5
Selected nations						
Australia	1,903.6	2.3	47.0	2.7	—	48.0
Brazil	2,104.3	2.2	10.4	46.5	3.4	37.5
Canada	2,461.2	3.9	2.2	33.8	7.3	52.8
China	2,405.8	9.4	19.9	8.6	—	62.1
Egypt	247.1	2.4	—	—	0.7	96.9
France	136.3	38.6	22.3	20.7	10.1	8.3
India	810.7	40.0	—	11.5	12.1	36.4
Italy	74.3	51.5	17.0	18.7	5.0	7.8
Japan	91.0	13.8	3.7	61.2	—	21.3
Mexico	486.7	7.6	49.2	22.9	4.6	15.7
Sweden	110.9	8.4	2.1	51.2	3.6	34.7
United Kingdom	60.2	30.0	50.0	6.3	—	13.7
United States	1,934.2	24.7	32.6	32.1	0.8	9.8

* Land-use data for the U.S.S.R. are not included in the totals for Europe or Asia but are reported separately.

† These totals include total area within boundaries, not total surface area.

SOURCE: *Yearbook of Food and Agricultural Statistics- Production, 1953* (Rome: Food and Agricultural Organization of the United Nations, 1954), Vol. 7, Part 1. The data reported by countries involve the latest official reports or, where these are not available, the latest reliable unofficial estimates. The data reported for China and the Soviet Union are for 1947; the data for all of the other selected nations are based upon official reports made in 1950, 1951, or 1952.

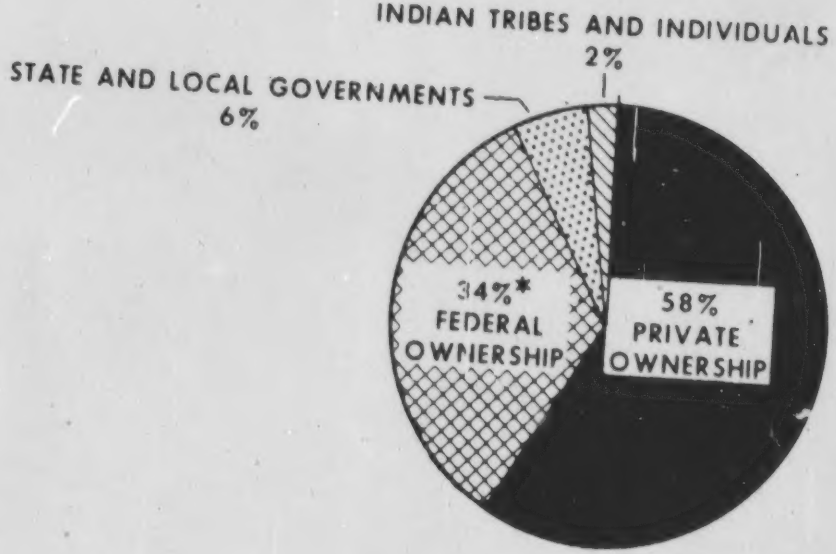
Changes In Land Use In The USA

Land Use	1949	1959	1969
	Million acres	*Million acres*	*Million acres*
Cropland			
Used for crops	387	359	336
Other cropland	91	99	139
Pasture and range	951	878	802
Total agricultural land	1,429	1,336	1,277
Ungrazed forest land	400	483	525
Urban and transportation areas	42	52	61
Recreation areas, wildlife refuges, and public facilities	84	89	109
Other land	318	311	292
Total nonagricultural land	844	935	987
Total land area	2,273	2,271	2,264

Source: Handbook of 1972 Agricultural Charts, p. 21.

102-1-7

LAND OWNERSHIP IN THE 50 STATES, 1969



TOTAL AREA 2.3 BIL. ACRES

* 94 PERCENT IS IN THE ELEVEN WESTERN-MOST STATES AND ALASKA. ABOUT 50 PERCENT IS IN ALASKA.

U.S. DEPARTMENT OF AGRICULTURE

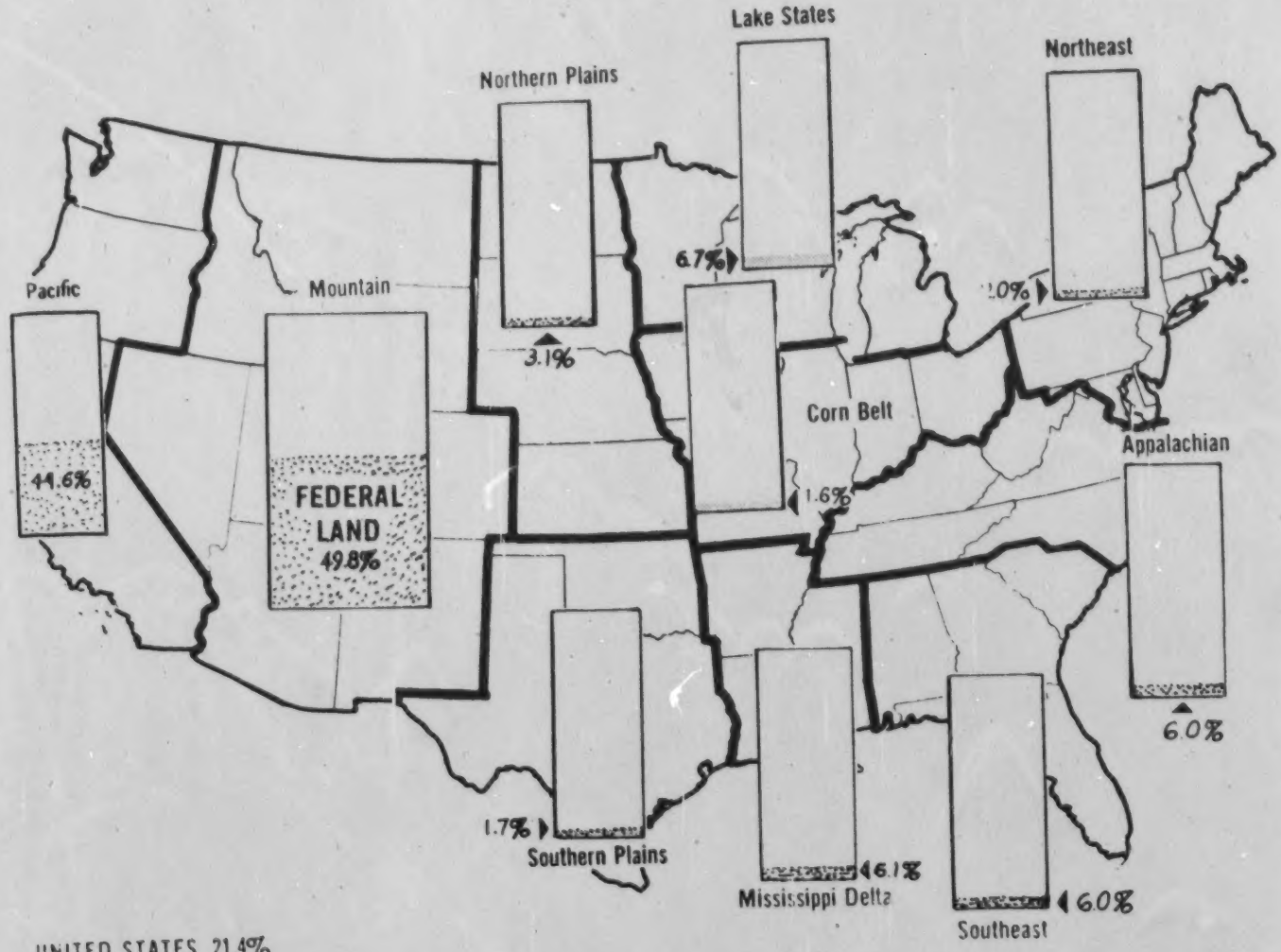
NEG. ERS 8433-72 (8) ECONOMIC RESEARCH SERVICE

Source: Book of Ag Charts, p. 22.

[redacted]

102-1-8

PROPORTION OF LAND IN
FEDERAL OWNERSHIP, 1956

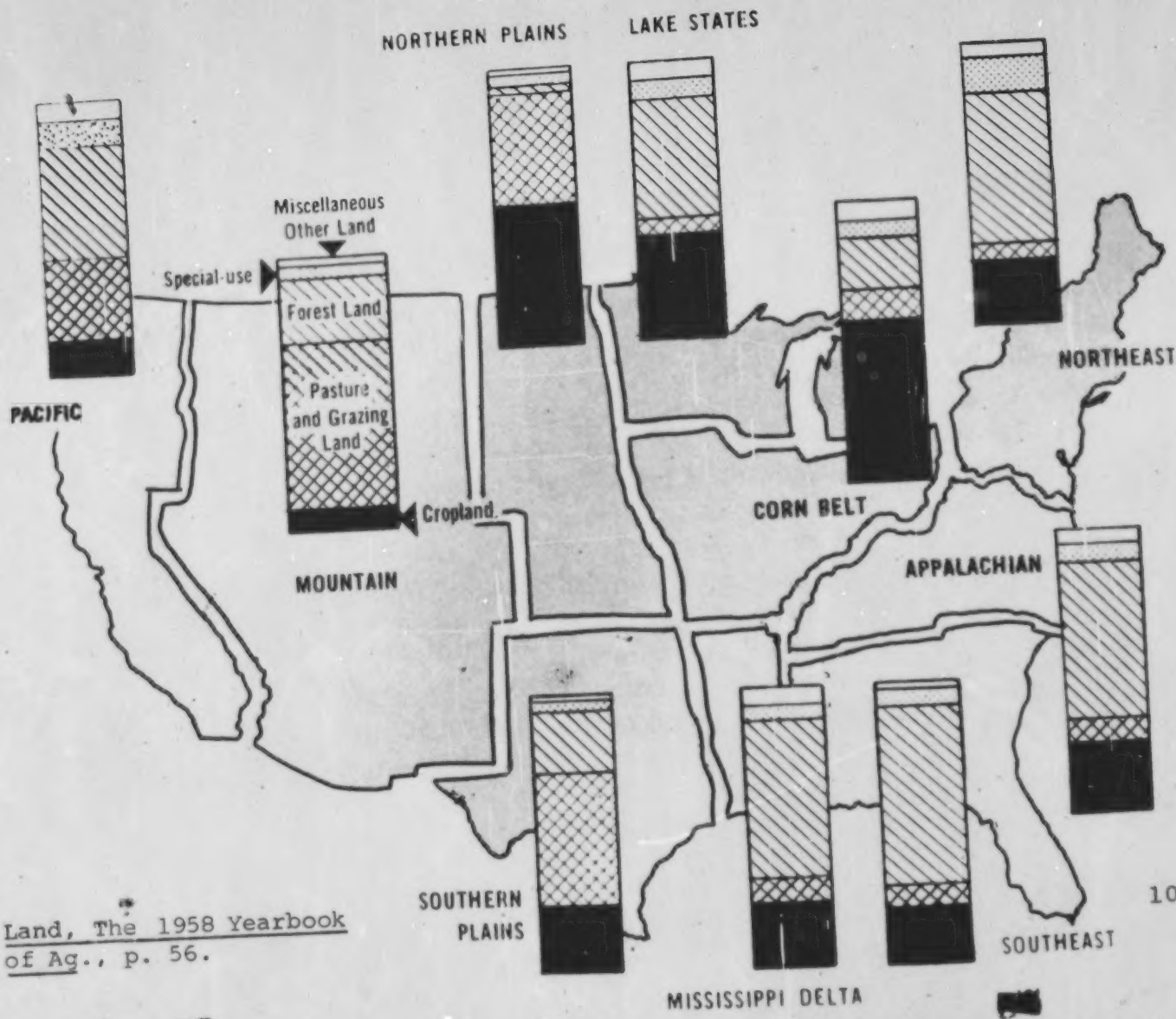


UNITED STATES 21.4%

Source: Land, The 1958 Yearbook of Ag., p. 44.

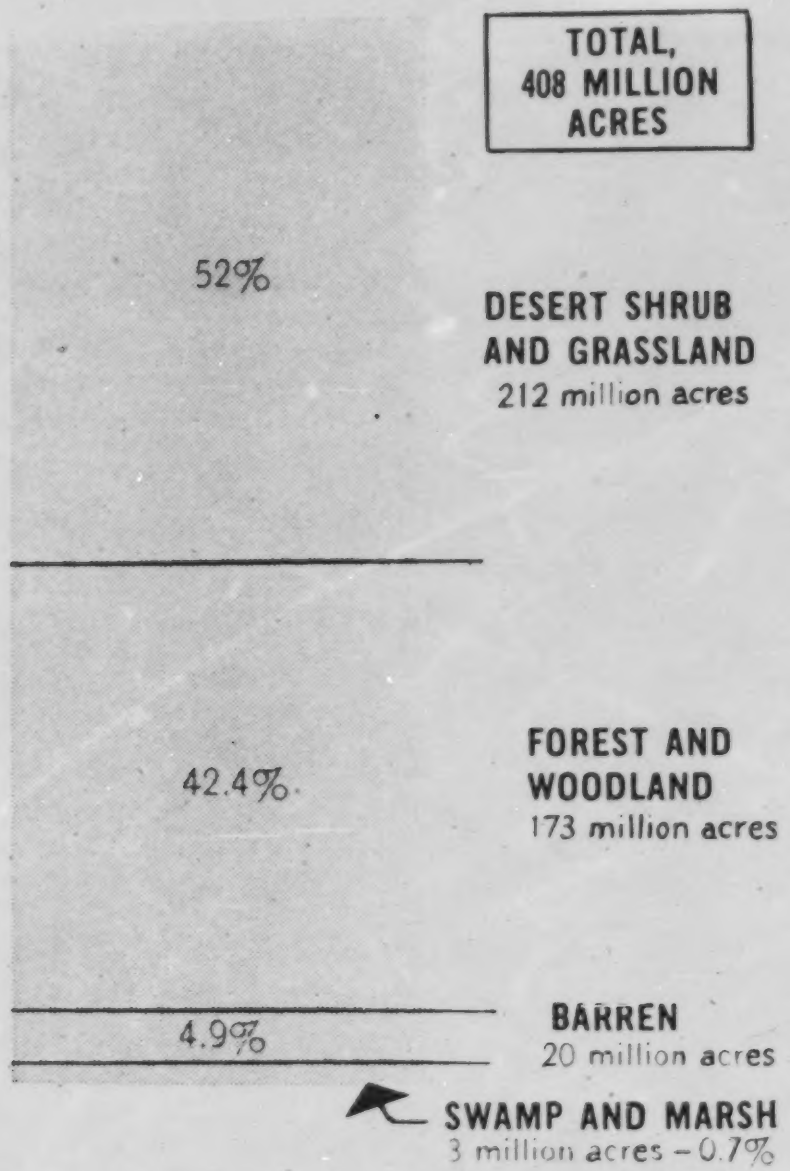
102-1-9

MAJOR USES OF ALL LAND AS
COMPARED WITH TOTAL LAND AREA, 1954



Source: Land, The 1958 Yearbook of Ag., p. 56.

102-1-10



Principal vegetative cover types on Federal land.

Source: The 1958 Yearbook of Ag., p. 50. 102-1-11

LAND USE WORKSHEET

	CO.	KENTUCKY
TOTAL LAND AREA		25,510,881
1958 URBAN LAND		732,182
1967 " "		834,858
SMALL WATER AREA 3 a. or more		121,156
TOTAL AGRICULTURAL LAND		
1958		23,837,748
1967		23,507,491
CROPLAND 1958		6,814,059
1967		6,586,739
PASTURELAND 1958		4,584,524
1967		5,164,880
FORESTLAND 1958		10,875,859
1967		10,988,166
OTHER AGRICULTURAL LAND		
1958		1,563,311
1959		767,106

AMOUNT OF LAND IN _____ COUNTY
IN CLASS OF LAND

CLASS	A.
I	_____
II	_____
III	_____
IV	_____
VI	_____
VII	_____

102-1-12

Lesson 2

THE PHYSICAL AND CHEMICAL PROPERTIES OF THE SOIL

Objective -- To develop the effective ability of land holders to understand the physical and chemical features of the soil.

Problem and Analysis -- How do physical and chemical properties of soil influence crop production?

-Principles of plant nutrition
-Physical properties of soil
-Chemical properties of soil

Content

Introduction--

The life processes of plants have startling similarities to those of human beings and animals. Plants and animals share birth, youth, adult life, reproduction, and death.

Though all major crops share the processes of growth, these processes are controlled or affected by the heredity and environment of specific crops.

For a soil to be in good physical condition for plant growth, the air, water, and solid particles must be in the right proportions at all times. The physical properties of a soil largely determine the ways in which it can be used. The important physical and chemical properties of the soil greatly affect the vital plant processes.

I. Principles of Plant Nutrition

A. Processes that take place in plants
1. Photosynthesis. Water and carbon dioxide are utilized in the presence of light and chlorophyll in green plants to form sugar and oxygen (basic food production process).
2. Transpiration. The loss of water in the

form of vapor. More than 99 percent of the water absorbed by most plants is given off in this way through tiny openings in the leaf, called stomata.

3. Respiration. The process by which the plant releases the energy stored by photosynthesis. The by-products of respiration are usually carbon dioxide and water.
4. Digestion. The process by which plants convert food reserves stored after photosynthesis into forms that permit respiration to take place.
5. Assimilation. The process by which plants convert food into protoplasm and cell walls.
6. At the present time, 16 elements are known to be necessary for a plant to grow normally. They are: Carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, manganese, boron, copper, zinc, iron, molybdenum, and chlorine.

II. Physical Properties of Soil

A. Makeup of soil
   1. Mineral matter
   2. Organic matter
   3. Soil air
   4. Soil water

B. Texture of soil (affects workability, moisture storage, and nutrient reactions)
   1. Clay, silt, and sand,
   2. Sandy soil
   3. Loamy soil
   4. Clayey soil

C. Soil structure influenced by (relates to ease with which soil can be tilled and penetrated by plant roots.)
   1. Organic matter content
   2. Texture (relative amounts of sand, silt, clay)
   3. Bulk density (compactness)
      a. Cultivation vs. no cultivation
      b. Use of machinery

D. Soil profile (what a soil looks like)

1. A horizon--usually dark in color because of organic matter, lighter in texture than B or C
2. B horizon--usually low organic matter, higher clay content
3. C horizon--underlies B horizon. Essentially no organic matter in upland soils, and structure usually undersirable.

III. Chemical Properties of Soil

A. Elements necessary for plant growth (See masters 7-9 at the end of the lesson.)

B. Elements necessary in large quantities--C-H-O-N-P-K-Ca-Mg-S (See Masters 8 and 9.)

C. Sources from which plants get necessary elements

D. The need for added nitrogen, phosphorus, potassium, and calcium in most Kentucky soils

NOTE: The teacher should refer to HS-1&3, for a more complete treatment of physical and chemical properties soil.

Suggestions for Teaching the Lesson

I. Development the Situation

A. Things to be brought out by the teacher:
1. The life processes of plants are similar to those of humans.
2. Explain plant processes by using transparency masters.
3. The importance of good physical and chemical properties for the highest crop and livestock yield.
4. A sound plan for maintaining or improving the physical and chemical properties of the soil.

B. Things to be brought out by the class members:
1. Their ideas of the general grouping of the soil textural class names.
2. Classification of samples taken from at least one field on their farms.

3. The farming practices they feel will help the physical properties of their soils.
4. The amount of time it takes for various fields on their farm to be ready to be cultivated after 1" of rain.
5. Elements usually added to their row crops and in what amounts.

II. Conclusions

A. Good soil structure promotes more extensive root spread through the soil by plants, thus giving a larger source of nutrients and water.

B. A sound cropping rotation will tend to build structure.

C. All 16 elements in the soil are needed for high crop and livestock production.

III. Enrichment Activities

A. Observe under a microscope the cell structure in slices of plant tissue, such as in a potato.

B. Observe the stomata of leaves with magnifying instruments.

C. Demonstrate how much starch is stored in a potato. Use the iodine test, which will give a deep purple color.

D. Collect samples of soil from members and compare their tilth.

E. Observe soils that have been under grassland farming and compare them to similar soils that have been used for continuous row cropping.

F. Collect samples of soil from home farms and classify them as to soil texture.

IV. Suggested Teaching Materials

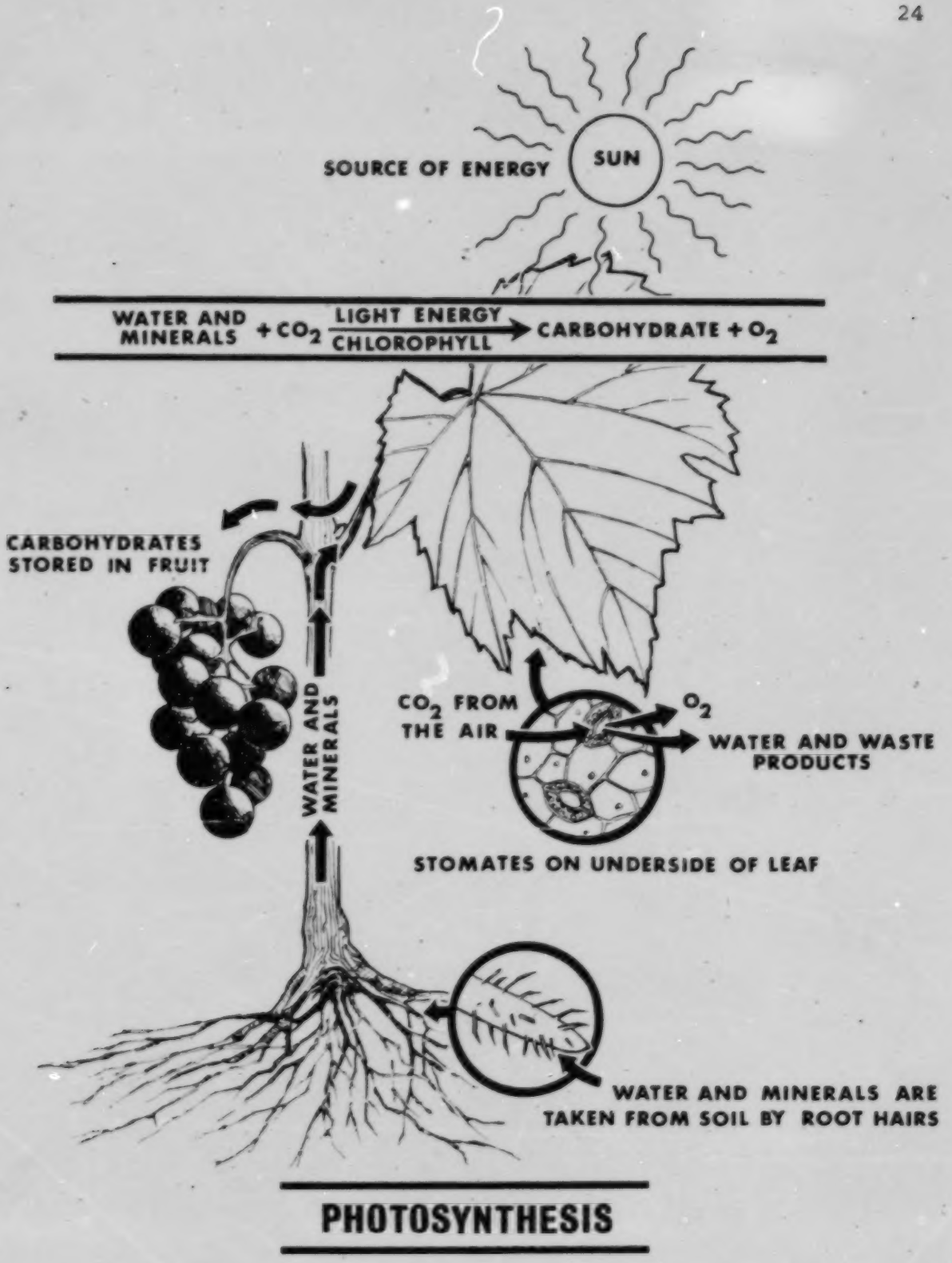
A. References for Lesson 2
1. Profitable Soil Management, Chapters 6 and 8.

2. Soil, 1957 Yearbook of Agriculture.
3. Soils Handbook, Misc. 383, U.K.
4. "The Case for Plant Tissue Analysis," Ralph E. Castenson, Fertilizer Solutions Magazine, Reprint, July-August, 1970 issue.
5. Using Commercial Fertilizers, Chapters 1 and 2.

B. Resource personnel
   1. Local SCS personnel (if soil scientists)
   2. Soils specialist, U.K.
   3. For specific personnel see the VoAg Directory of Resource People in Kentucky

C. Audio-visuals
   1. Masters
      -1 Photosynthesis
      -2 Transpiration
      -3 Test of Soil Properties
      -4 General Groupings of Soil Textural Classes
      -5 Structural Units of Soil
      -6 Texture Triangle
      -7 Specific Surface vs. Size of Soil Particles
      -8 Essential Elements for Plants
      -9 Plants Dine
      -10 Functions of Some Elements in Plant Growth

   2. Films (USDA) available from Division of Conservation, Frankfort, Kentucky
      a. "Topsoil," 10 min. B&W
      b. "Yours is the Land," 21 min. Color


SOURCE OF ENERGY
SUN
WATER AND MINERALS + CO_2 LIGHT ENERGY / CHLOROPHYLL → CARBOHYDRATE + O_2
CARBOHYDRATES STORED IN FRUIT
WATER AND MINERALS
CO_2 FROM THE AIR
O_2
WATER AND WASTE PRODUCTS
STOMATES ON UNDERSIDE OF LEAF
WATER AND MINERALS ARE TAKEN FROM SOIL BY ROOT HAIRS

PHOTOSYNTHESIS

102-2-1

Source: Exercises in Biological Principles for Agricultural Crops, VEP Production, p. 14.

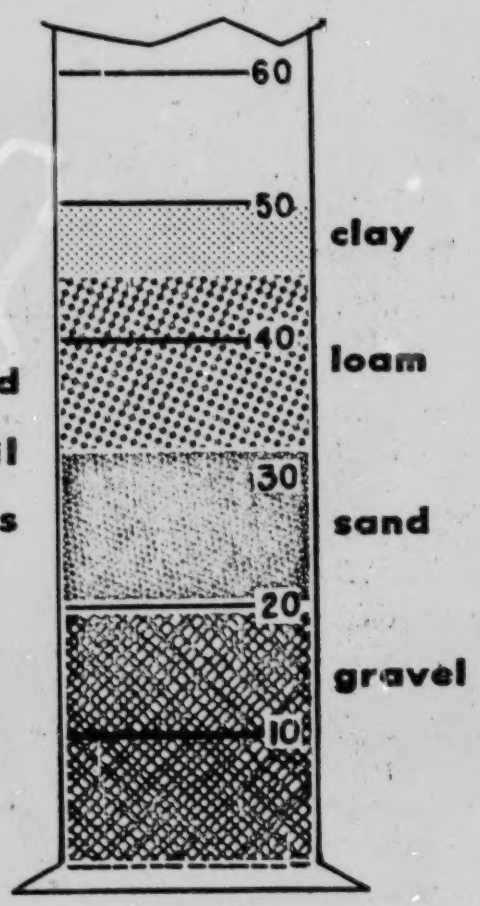
TRANSPIRATION

102-2-2

Source: Exercises in Biological Principles for Agricultural Crops, p. 24.

Separated Soil. You can determine the texture of a soil by adding a representative sample to water, shaking vigorously until the soil is in suspension, and then allowing the mixture to settle. The largest, heaviest particles will settle at the bottom, the lightest and smallest at the top.

Test of soil properties



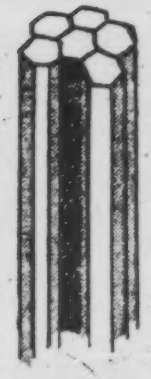
SOURCE: Teaching Soil and Water Conservation 102-2-3

WHAT IS SOIL? - General Grouping of Soil Textural Classes
(USDA Classification)

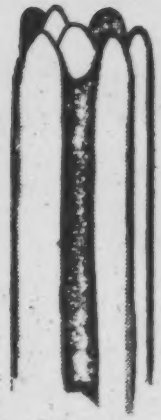
First Grouping	Second Grouping	Basic Soil Textural Class Names
(I) Sandy soil	(1) Coarse-textured soil	Sand Loamy sand
	(2) Moderately coarse-textured soil	Sandy loam Fine sandy loam Very fine sandy loam
(II) Loamy soil	(3) Medium-textured soil	Loam Silt Loam Silt
	(4) Moderately fine-textured soil	Clay loam Sandy clay loam Silty clay loam
(III) Clayey soil	(5) Fine-textured soil	Sandy clay Silty clay Clay

The above classification permits classifying soils first into three general groups as (I) sandy soil, (II) loamy soil, and (III) clayey soil. The second grouping of five general classes is (1) coarse-textured soil, (2) moderately coarse-textured soil, (3) medium-textured soil, (4) moderately fine-textured soil, and (5) fine-textured soil. The basic soil textural classes fall in the further general groupings shown above.

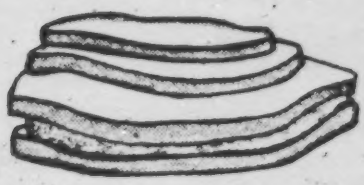
SOURCE: Teaching Soil and Water Conservation 102-2-4



Prismatic



Columnar



Platy

Blocky

Nutlike

Granular

Crumb

Structural Units of Soil. While soil texture involves the size of individual soil particles, soil structure involves the various ways in which these particles may be arranged in groups (aggregates). You can distinguish different soil structures by observing the cracks or "lines of cleavage" of a soil.

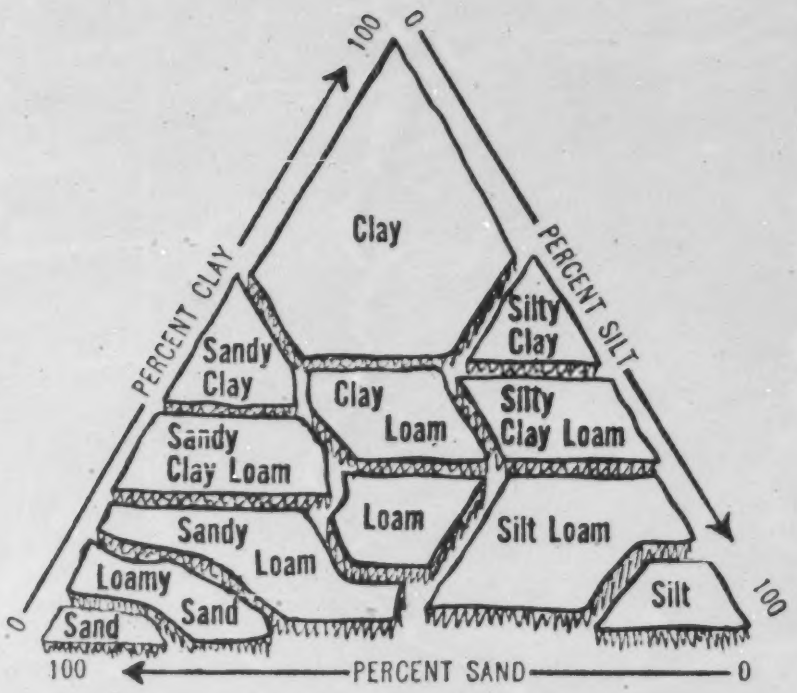
Soils are said to be *structureless* when the particles of coarse soil fail to cling together, when fine soil breaks into large clods, or when the soil is *massive*, a single compacted substance.

Soils with good structure provide for a favorable movement of soil, air, and water; they have more easily available plant nutrients, and are easier to till.

102-2-5

Source: Teaching Soil and Water Conservation

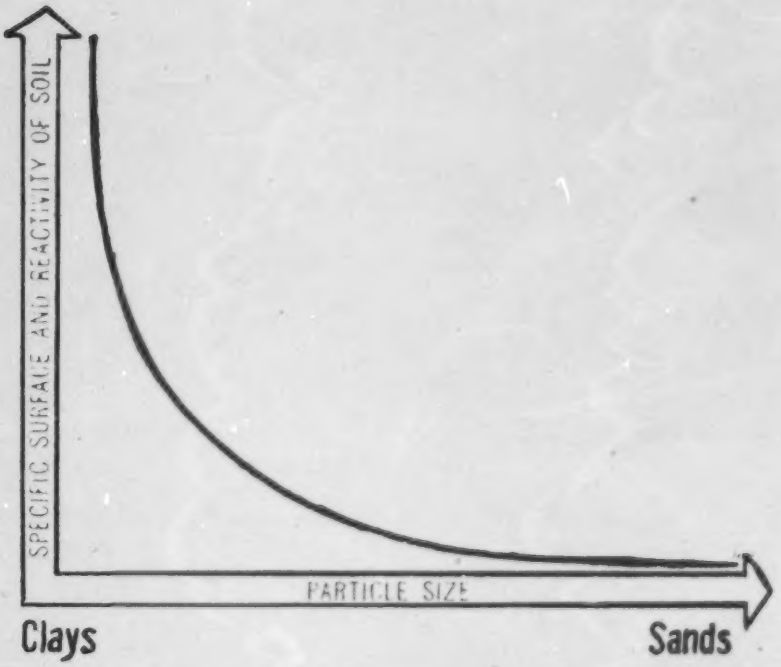
TEXTURE TRIANGLE



The texture triangle shows the percentage of sand, silt, and clay in each of the textural classes.

SOURCE: Teaching Soil and Water Conservation 102-2-6

SPECIFIC SURFACE
vs.
SIZE OF PARTICLE



Specific surface is important in determining the reactivity of soils. The amount of surface varies inversely with the size of the soil particles.

SOURCE: Teaching Soil and Water Conservation 102-2-7

ESSENTIAL ELEMENTS FOR PLANTS

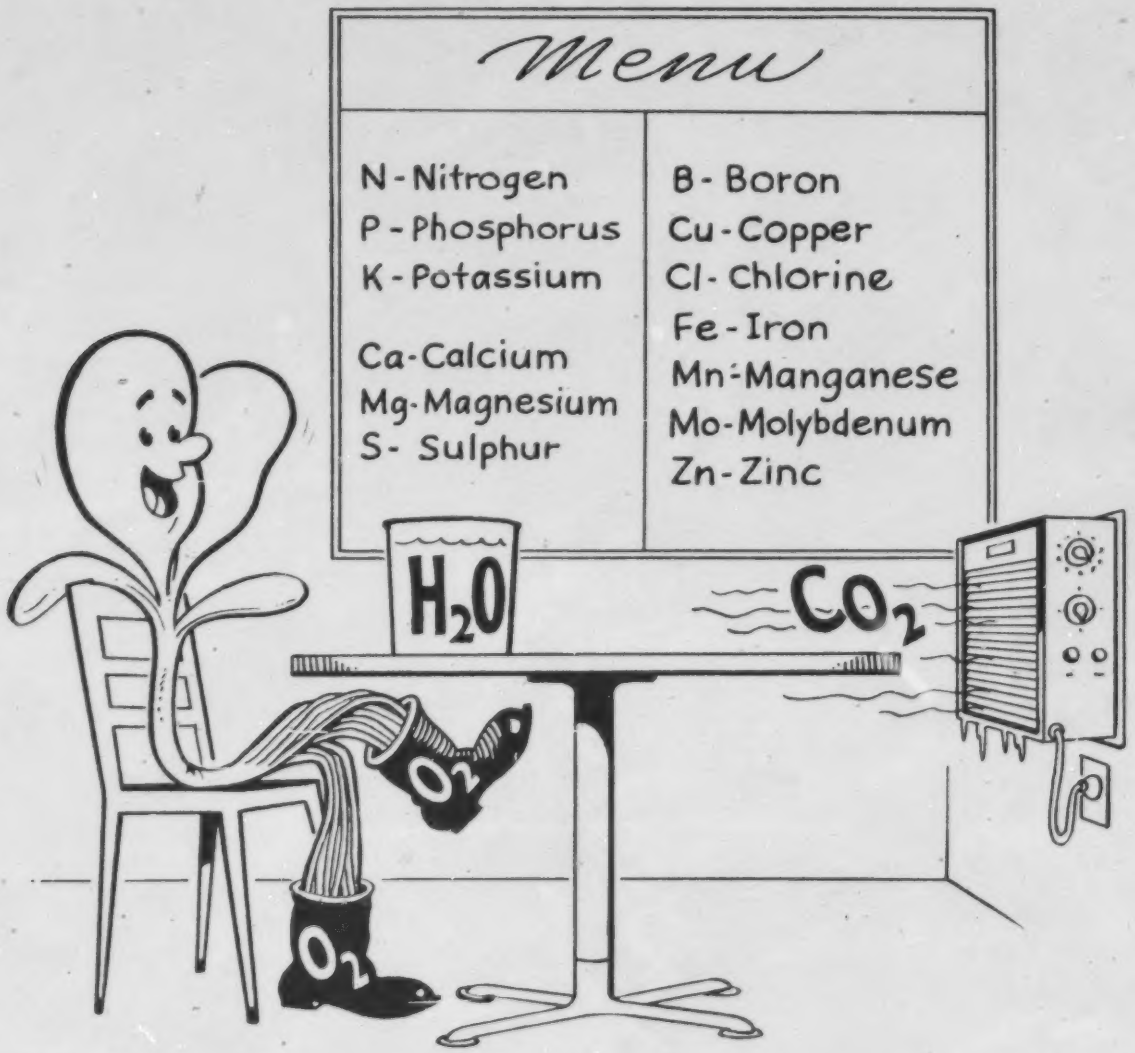
Relative Quantities and Sources

From Air and Water	From the Soil	
Large Amount	Large Amount	Small Amount
C - Carbon H - Hydrogen O - Oxygen * N - Nitrogen	N - Nitrogen P - Phosphorus K - Potassium Ca - Calcium Mg - Magnesium S - Sulfur	B - Boron Cl - Chlorine Cu - Copper Fe - Iron Mn - Manganese Mo - Molybdenum Zn - Zinc

* Nitrogen from the atmosphere can only be used indirectly (through soil organisms).

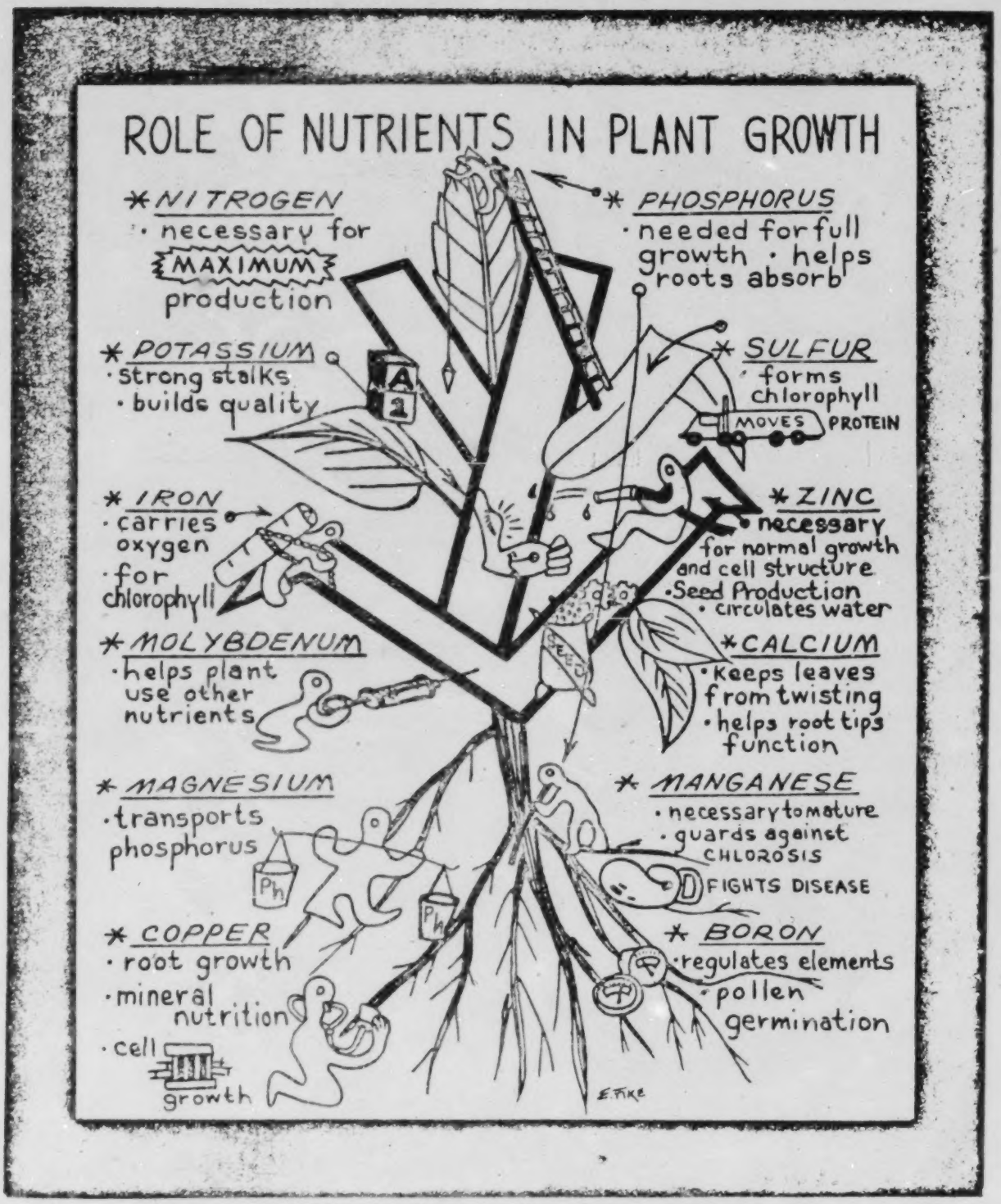
PLANTS DINE AT

C HOPKNS CaFe Mg



102-2-9

T. VANTREESE, INST. MATL. LAB., U.K.



Some of the functions pointed out may not necessarily be the most important function of that particular element.

SOURCE: Crops and Soils Magazine 102-2-10

Lesson 3

SOIL TESTING AS A TOOL OF LAND USE

Objective -- To develop the effective ability of land holders to utilize soil testing as a tool of land use.

Problem and Analysis -- How can we use soil testing as a tool of land use?

-Taking and handling good soil samples
-Plant-tissue tests
-pH levels of soils
-Soil reaction and liming
-Time and placement of lime

Content

Introduction

Soil testing is a must for the farmer and grower of today, if he is to use lime and fertilizer materials correctly. The last official survey to determine the number of soils tested in the United States was made in 1966. The estimate was just under 4 million soil samples tested, which is probably considerably less than the number being tested today.

Recent summaries of soil-test results indicate that at least three-fourths of the fields used for crop production in Kentucky are too acid for maximum production of most crops, particularly the valuable legumes. Proper use of good liming materials can counteract this excess acidity and result in greater yields, when used with proper amounts of fertilizer.

I. Taking and Handling Soil Samples

A. Procedure
1. Take samples with an auger, soil-sampling tube, or spade.
2. Each sample should be a random sampling of a given field.

3. Each sampling should be 8 to 10 inches in depth.
4. All samplings should be placed in a clean container.
5. It is best to take samples in the summer or early fall.
6. Air-dry samples before sending them to the soil testing laboratory.

II. Plant-Tissue Tests

A. Growing plants can be chemically tested to determine the amounts of nutrients they contain.
   1. Green-tissue tests are made in the field from growing plants.
   2. Plant analysis is made in laboratories.
   3. Plant-tissue tests must be made after the crop is established.
   4. On many crops, the information from tissue tests is secured too late in the season to be beneficial in correcting the problem for that crop.
   5. Green-tissue testing field kits can be purchased.

B. The plant tissue test is a means to double check on soil tests.

III. pH Levels of Soils

A. Soils are either acid, neutral, or alkaline in chemical reaction.

B. Crops vary in the amount of soil acidity and alkalinity that they favor or tolerate.
   1. Most crops favor a slightly acid soil.
   2. Soil acidity that crops favor is also favorable to the activities of soil microorganisms.
   3. Excess soil acidity can be corrected by adding liming materials to the soil.

C. The acidity or alkalinity of the soil solution is determined by the relative number of the hydrogen ions and hydroxyl ions.

D. Soil reaction is expressed in pH values. The "p"

refers to "pressure" and the "H" to "Hydrogen ions". "pH" refers to the pressure or concentration of hydrogen ions.

E. The range in pH is from 0 to 14. A pH of 7 is neutral. Any pH below 7 is acid, and any pH above 7 is alkaline.

IV. Soil Reaction and Liming

A. Benefits from liming:
1. Reduction of soil acidity
2. Two major plant nutrients supplied by liming materials are calcium and magnesium
3. Means of controlling some crop diseases
4. Influences the solubility of many compounds in the soil
5. The activity of the microorganisms and consequently the phosphorus and nitrogen fertility generally increase when an acid soil is limed.

B. The main aim of liming is to mix lime uniformly with the surface layer of soil.
1. The quality of a liming material is determined by purity and fineness.
2. Soil-test results and a knowledge of past treatment and cropping history provide the best information available for determing the lime needs for a particular crop.

V. Time and Placement of Lime

A. Lime can be applied any time of the year without loss from leaching. Allow six months for maximum effect.

B. Lime can be topdressed on hay and pasture fields after any harvest during the year or before growth starts in the spring.

C. Lime can be applied on row crop land immediately after harvest or on sod land in the fall or winter for any crop to be planted in the spring.

D. Lime should be applied before tillage and worked into the soil.

E. Lime should be applied before disking for renovation.

F. Lime should be plowed down or disked in ahead of planting row crops.

Suggestions for Teaching the Lesson

I. Developing the Situation

A. Things to be brought out by the teacher:
1. The need for soil testing in our country
2. Soil testing is a tool of land use as valuable as the tractor that pulls the field implement
3. There are soil tests and tissue tests
4. Uses to be made from soil or tissue testing
5. Certain steps are necessary in getting a good soil or tissue test
6. The pH level may vary from field to field on the same farm

B. Things to be brought out by the class members:
1. Recall fields on the home farm that formerly produced good clover or alfalfa crops and now produce largely grass crops
2. Recall fields that have good stand of sage grass or cedar trees
3. Number of men who are liming and their experiences with liming
4. Why might they ignore a soil-test report?
5. Different crop yields by fields on individual farms

II. Conclusions

A. The results of a soil test will be no better than the individual who takes the soil sample. It is very essential to use the proper procedure in taking and handling a soil sample.

B. A plant-tissue test can only be made after the crop is established and will probably be too late to help the crop during that growing season.

C. Crops vary in the amount of soil acidity and alkalinity that they favor or tolerate.

D. Soil-test results and past knowledge of the field in question provide the best information available for determining the lime needed for a particular crop.

E. The best time to apply lime on row crop land is immediately after harvest; on sod land, fall or winter tests are best for any crop to be planted in the spring. Lime can be topdressed on hay and pasture fields after any harvest during the year or before growth starts in the spring. Lime should be worked into the soil if at all possible. Allow six months for lime to take effect.

III. Enrichment Activities

A. Test soils from home farms for acidity. Secure and use a reliable testing kit.

B. Take a field trip to practice taking soil samples and plant tissue tests.

C. Use the soil testing kit to test soil samples from:
1. fence rows
2. dead furrows
3. continuous cultivated fields
4. old pasture fields

D. Demonstrate tissue on house plants or field crops grown in pots or boxes.

IV. Suggested Teaching Materials.

A. References for Lesson 3
1. Controlling Soil Acidity, Ky. Circular 584.
2. Crops and Soils Magazine, April-May 1973, June-July 1973.
3. Farm Soils, pp. 208-237.
4. Soil Sampling, How to and What for, Ky. leaflet AGR-16.
5. Lime and Fertilizer Recommendations, Ky. circular AGR-1.
6. Profitable Soil Management, Chapters 9-12.

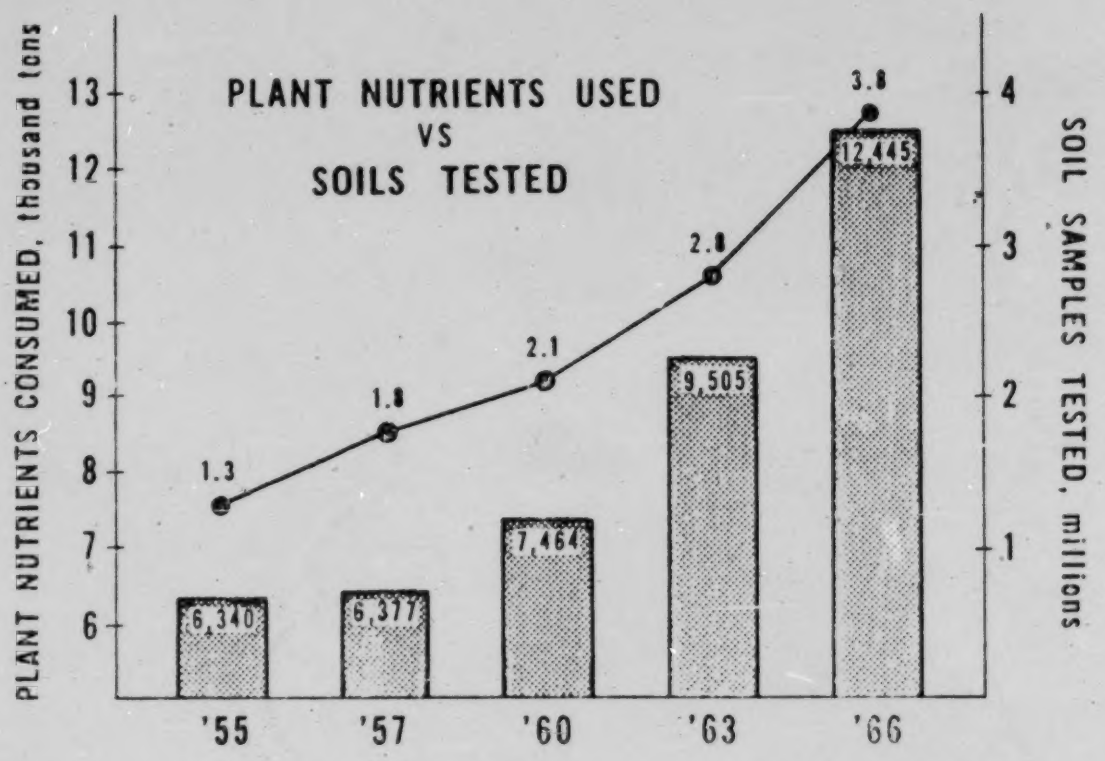
7. Soil, the 1957 Yearbook of Agriculture, pp. 172-193.
8. When to Apply Lime and Fertilizer, AGR-5.

B. Resource personnel
1. Soil Conservation Service
2. Forestry Service
3. ASC
4. County Extension Service
5. Commercial Fertilizer People
6. Any good young or adult farmer
7. For specific personnel, see the VoAg Directory of Resource People in Kentucky.

C. Audio-visuals
1. Masters
-1 Soil Tests vs. Plant Nutrients Used
-2A,B Random Sampling of Fields
-3A,B pH Scale
-4 Degree of Acidity That Crops Favor
-5 Humid vs. Sub-humid Region of U. S.
-6 Mesh Size of Limestone
-7 Solve Soil Test Problems
-8 Our Yearly Log
-9 Main Tools to Use With Crops
-10 Don't Ignore Soil-Test Reports
-11 Think Liming
-12 Profit With Liming
2. Films
a. "The Soil is Good," from the Division of Conservation, Frankfort, Ky., 40 min. Color. Cover the importance of soil.
b. "Raindrops and Soil Erosion," 30 min. Color.

SOIL TESTS VS. PLANT NUTRIENTS USED (1966)

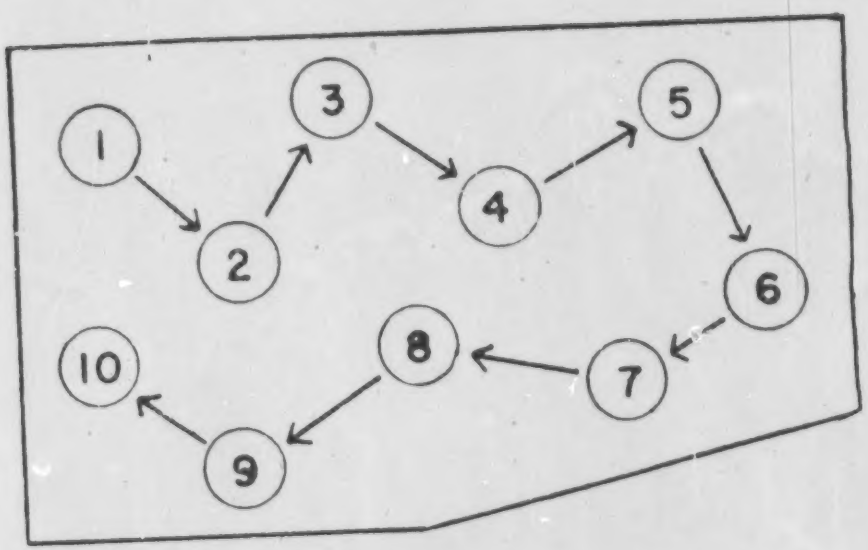
The number of soils tested, line, closely paralleled the amount of plant nutrients, bars, consumed between 1955 and 1966.



102-3-1

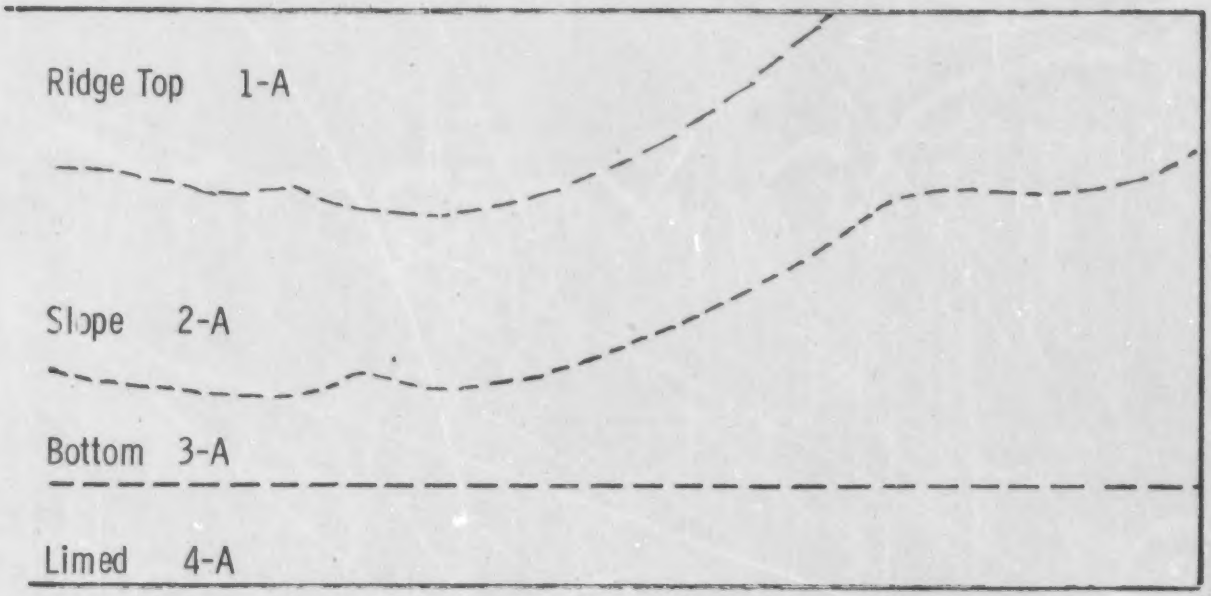
Source: USDA

RANDOM SAMPLING OF FIELDS



Field diagram for collecting soil cores

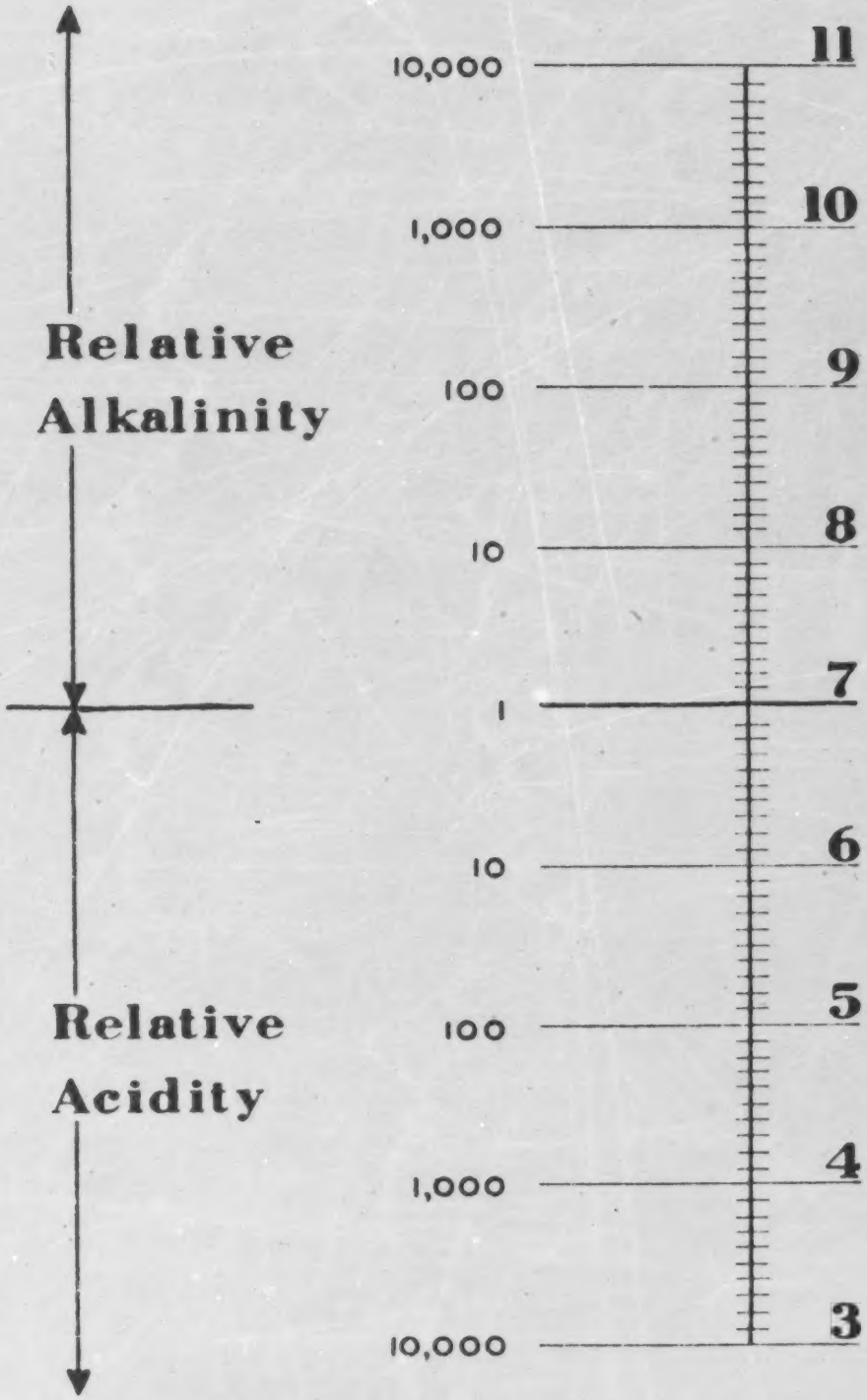
102-3-2A



Field diagram for collecting soil samples

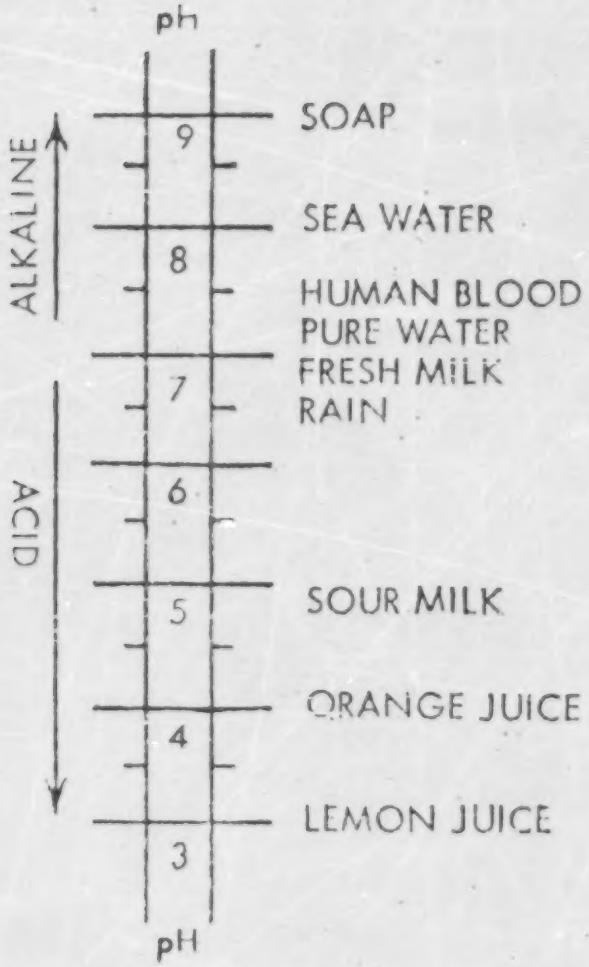
102-3-2B

*p*H Scale



102-3-3A

pH SCALE



102-3-3B

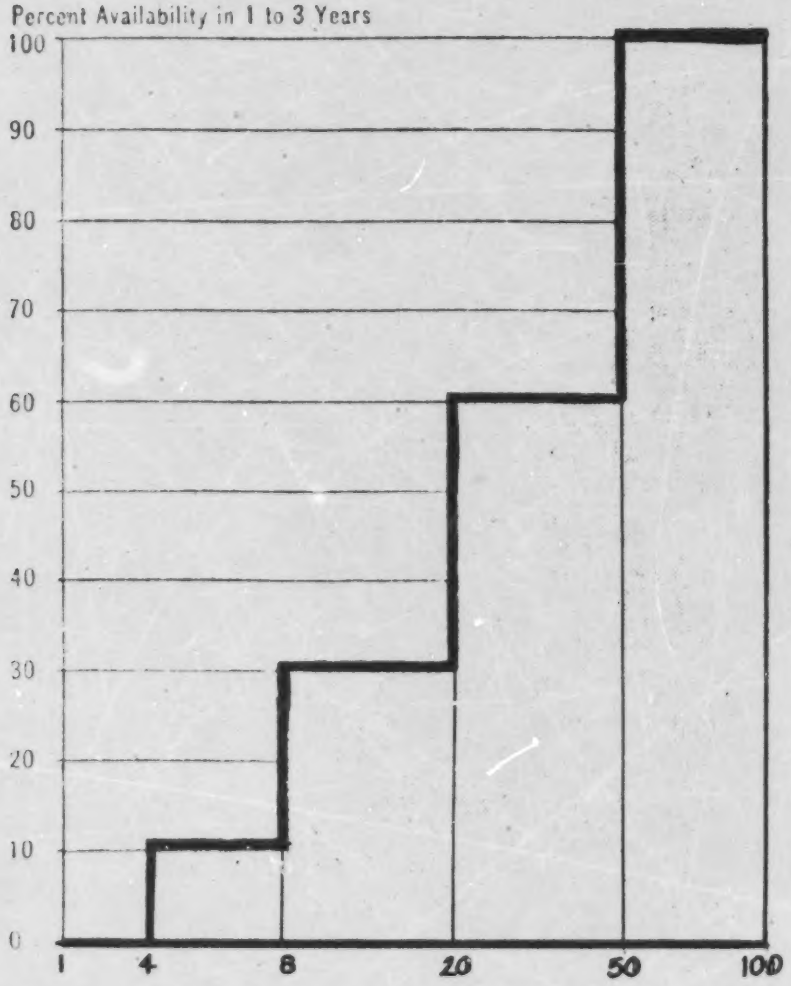
DEGREE OF ACIDITY THAT CROPS FAVOR

	Weakly Acid Soil	Moderately Acid Soil	Acid Soil	Strongly Acid
Legumes	Alfalfa Sweet clover Ladino clover	Red clover Alsike White clover Peas Lima, pole, and snap beans Soybeans	Vetch Crimson clover Field beans Kudzu Lupine Velvet beans	
Field Crops	Sugar beets	Cotton Peanuts Wheat	Barley Corn Oats Rye Tobacco Buckwheat Sorghum Millet Redtop	
Vegetables and Fruits	Cabbages Cauliflower Lettuce Onions Spinach Asparagus Beets Parsnips Rutabagas Celery Muskmelons	Carrots Cucumbers Brussels sprouts Kale Kohlrabies Pumpkin, squashes Sweet corn Tomatoes Turnips Radishes	Potatoes Sweet potatoes Parsley Strawberries	Blueberries Cranberries Watermelons

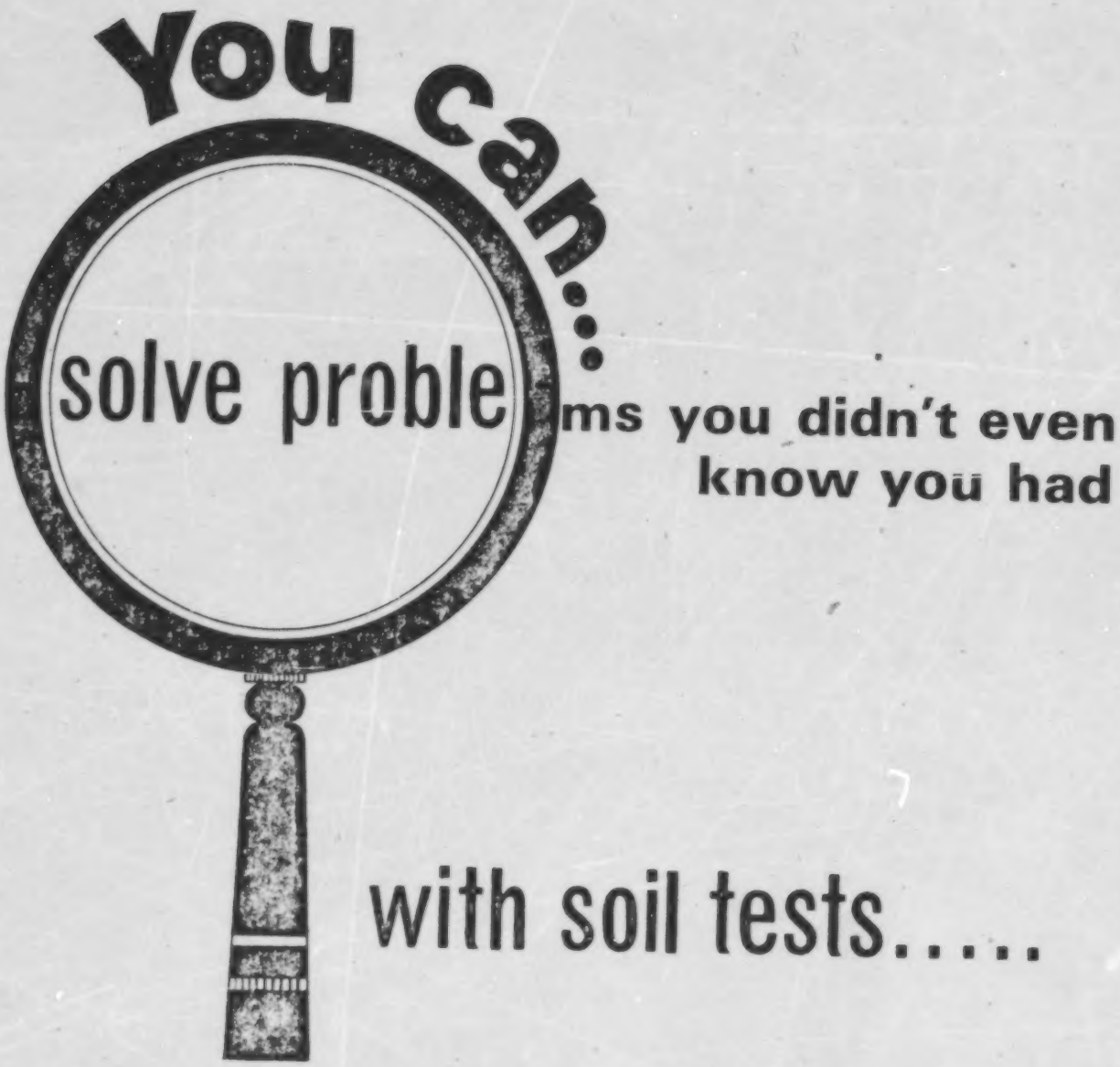
HUMID VS. SUB-HUMID REGION OF U.S.

102-3-5

MESH SIZE OF LIMESTONE



102-3-6



SOURCE: Sperry Rand, New Holland of Sperry Rand Corp., VoAg Visuals

102-3-7

What should be included in a yearly log?

1. Fields Tested
2. Test Report
3. Recommendations
4. Fertilizer-Lime Applications
5. Crops Grown
6. Yields - Price
7. Evaluation

SOURCE: Sperry Rand, New Holland Division of Sperry Rand Corp., VoAg Visuals

102-3-8

What are the 2 main tools that may be used if crops do not respond to fertilization?

1. Tissue Testing

2. Plant Analysis

SOURCE: Sperry Rand, New Holland Division of Sperry Rand Corp., VoAg Visuals

102-3-9

Why should a farmer be very careful when he ignores a soil test report?

1. It takes large amounts of fertilizer/lime for high crop yields.

2. High priced livestock and milk justify lime/fertilizer on pasture, too.

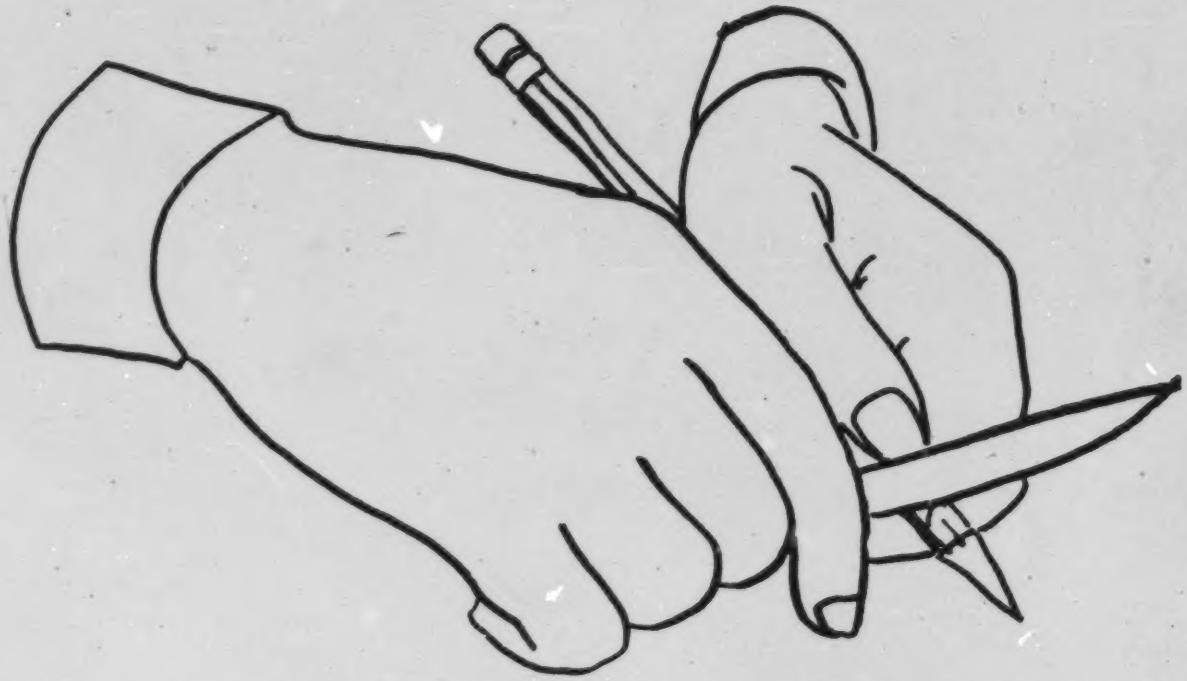
Source: VoAg Visuals, Sperry Rand.

102-3-10

SOURCE: Sperry Rand, New Holland Division of Sperry Rand Corp., VoAg Visuals

102-3-11

SHARPEN YOUR PROFIT PENCIL WITH



PROPER LIMING

Source: Sperry Rand, New Holland Division of Sperry Rand Corp., Vo-Aq Visuals

102-3-12

Lesson 4

BALANCED FERTILIZATION OF SOILS

Objective -- To develop the ability of farmers to provide balanced fertilization of our soils.

Problem and Analysis -- How much fertilization is enough?

- -Primary and secondary plant nutrients
- -Fertilizer terms
- -Dry-mix fertilizers
- -Liquid fertilizers
- -Principles involved in use of fertilizers
- -Fertility-moisture relationships
- -Amount of fertilizer to apply

Content

Introduction--

The old statement, "lime and fertilizer work hand in hand to produce maximum crop yields," is more meaningful now than in the past and will become even more meaningful in the future.

Each year, American farmers write checks for $2.4 billion dollars to cover the production expenses for fertilizers used to produce food and fiber. Veterinarians witness many disorders resulting from lack of adequate nutrients in livestock feeds, such as iron deficiencies and grass tetany. Balanced fertilization should improve animal health in these areas.

Twenty years ago more than one fifth of the farm production in this country was credited to the use of fertilizer. Without the use of fertilizer, it would take at least fifty million additional acres to produce our present quantities of farm products. The cost of cultivating such an acreage alone would be more than three times the annual expenditure for fertilizer. This gives some idea of the importance of fertilizer to America's agricultural production.

I. Primary and Secondary Plant Nutrients

A. Primary elements are needed by the plant in large quantities from the soil
   1. Nitrogen--N
   2. Phosphorus--P, or in fertilizers designated as phosphate, P_2O_5
   3. Potassium--K, or in fertilizers designated as Potash, K_2O

B. Secondary elements--large quantities
   1. Calcium--Ca
   2. Magnesium--Mg
   3. Sulfur--S

II. Fertilizer Terms

A. Fertilizer grade--the quaranteed analysis, in percentages, of the three primary nutrients in the order of $N\text{-}P_2O_5\text{-}K_2O$. Example: 5-10-15

B. Fertilizer ratio--the ratio of two or more nutrients to another. Example: 5-10-15 grade has a 1-2-3 ratio.

C. Fertilizer formula--the quantity and grade of materials used in making a fertilizer mixture.

D. Acid-forming--a term applied to fertilizer materials that leave an acid residue in the soil. The amount of pure limestone required to neutralize the residue left by a fertilizer material is referred to as its "equivalent acidity."

E. Equivalent acidity per ton of some materials is as follows:
   1. Anhydrous ammonia
      2960 lbs. calcium carbonate
   2. Ammonium sulfate
      2200 lbs. calcium carbonate
   3. Ammonium sulfate
      1200 lbs. calcium carbonate
   4. Urea
      1500 lbs. calcium carbonate

F. Alkaline-forming--a term applied to fertilizer materials that leave an alkaline or basic residue

in the soil. The equivalent basicity per ton of some materials are:

1. Nitrate of potash
   460 lbs. calcium carbonate
2. Nitrate of soda
   583 lbs. calcium carbonate

G. Available--capable of being assimilated by growing plants. Available nitrogen is defined as that nitrogen that is water-soluble plus what can be made soluble or converted into free ammonia.

H. Complete fertilizers--contains all three primary nutrients--N, P_2O_5, and K_2O.

I. Straight fertilizers--contain only one nutrient.

III. Dry-Mix Fertilizers

A. Dry-mixed fertilizers are made by combining selected plant food materials to obtain certain ratios and quantities of plant nutrients.

B. When dry, mechanically-mixed fertilizers of definite analysis are manufactured, some "make-weight" material is usually added. It may be a physical conditioner and/or filler or both.

IV. Liquid Fertilizers

A. The agronomic advantages or disadvantages are based primarily on the desirability of more or less soluble forms of plant foods for use under specific crop or soil conditions.

B. Advantages of liquid fertilizers
   1. More uniform broadcast applications
   2. Solubility for "transplant-starter" solutions
   3. Nutrients are in soluble form; homogeneous to soil moisture
   4. More adaptable to foliage-spray application
   5. Advantageous in dry seasons

C. Disadvantages of liquid fertilizers

1. Limited plant food content, in some cases
2. Difficult to achieve "localized-placement" with respect to seed
3. Application to growing plants must be made in dilute solution to avoid foliage burning

V. Principles Involved in the Use of Fertilizers

A. Many factors affect the amount of plant food a crop takes up.
   1. The kind of crop
   2. The variety of crop
   3. The yield
   4. The soil type and condition
   5. The amount of rainfall
   6. The temperature
   7. The present fertility level
   8. The pH level of the soil
   9. The amount of lime and fertilizer applied

VI. Fertility-Moisture Relationships

Well fertilized crops use water more efficiently than poorly fertilized crops.

VII. Amount of Fertilizer to Apply

A. Plant nutrients differ in the way they may be applied most effectively as fertilizers because of the differences in their chemical properties, the amounts plants need, the chemical and biological activity in the soil, and their solubility (which varies according to formula and physical condition).

B. The amount of fertilizer to be applied depends largely on the kind of crop which is grown and the present fertility level of the soil.

C. At a certain point it would not pay to add more fertilizer because additional crop yields would not pay the cost of the added fertilizer.

D. When capital is limited, fertilize those crops which will give the greatest economic return for investment in fertilizer.

Suggestions for Teaching the Lesson

1. Developing the Situation

A. Things to be brought out by the teacher:
   1. The value of understanding the primary and secondary elements used by plants for proper growth.
   2. Fertilizer terms that will be used in connection with plants and soil in this lesson.
   3. Use of fertilizers ($N-P_2O_5-K_2O$) has increased greatly in the United States in the past 20 years, but we are not keeping up with actual needs.
   4. Advantages of dry-mix and liquid fertilizers.
   5. Disadvantages of dry-mix and liquid fertilizers.
   6. There are many factors that affect the amount of plant nutrients any given crop will use.
   7. Use of muriate of potash on tobacco will cause "white stem" and "high case" tobacco, because of excess chlorine.

B. Things to be brought out by the class members:
   1. Some experiences they have had with the use of complete or incomplete fertilizers.
   2. Leaching of nitrogen on crop land during very wet years.
   3. Samples of dry and liquid fertilizers.
   4. Examples of people they knew about in the early days who took up the soil-building allowances in phosphate under the government program (A.C.P.).

II. Conclusions

A. Balanced fertilization is the beginning of good nutrition. It increases the plant yield of energy and protein.

B. Balanced fertilization increases yield and quality of crops. (See masters at the end of the lesson.)

C. A deficiency of only one nutrient can severely reduce yields. A deficient nutrient is like a broken link in a chain. It sets the soil's capacity to produce a crop.

D. The amount of fertilizer we need to apply depends on kind of crop and variety, yield, soil type and condition, climate, weed-control methods, available capital, and the present fertility level.

E. Management of our fertilizer programs today and tomorrow will be for men with a pencil in their hand. This will mean a better balanced fertilization program of our soils for crops and livestock.

III. Enrichment Activities

A. Visit a fertilizer dealer where a variety of fertilizers can be observed.

B. Have samples of a variety of fertilizers in the class room.

C. Visit a manufacturing or mixing plant.

D. Use a fertilizer industry representative to visit with the class.

E. Have each class member make a work sheet including crop-yield goal, nutrient need, and cost of fertilizer being used to reach that goal.

F. Arrange for demonstrations of different methods of fertilizer applications.

G. Set up a small test area on the farm of one of your class members for a summer tour for the class.

IV. Suggested Teaching Materials

A. References for Lesson 4

1. Better Crops with Plant Food, Spring, 1972.

2. "How Fertilizer Moves and Reacts in the Soil," J. Harold Parker, Crops and Soils Magazine, November, 1973.
3. Lime and Fertilizer Recommendation Guide, Ky. Circular 619.
4. Profitable Soil Management, Chapter 13.
5. The New Guide to Soil Fertility and Livestock Profits, Royster Company, PO Drawer 1940.
6. Using Commercial Fertilizers, Chapters 8, 9, 19.
7. Fertilizer Use Facts for Kentucky, Ky. Cir. 624.
8. When to Apply Lime and Fertilizer, Ky. Leaflet, AGR. 5.

B. Resource personnel
   1. State Extension Service
   2. Soil Conservation Service
   3. Fertilizer dealer or representative
   4. Any good young or adult farmer
   5. Custom operator
   6. For specific personnel, see the VoAg Directory of Resource People in Kentucky.

C. Audio-visuals
   1. Masters
      -1 Soil Acidity Affects The Availability of Most Nutrient Elements
      -2 Plant Food Utilization Breakdown by Crops
      -3 Average Nutrient Analysis
      -4 United States Seasonal Consumption
      -5 Burden Still in Spring
      -6A-C What Happens to Ammonium Nitrate
      -7 Movement of Phosphate in Soil
      -8 The Weakest Link
      -9 Nutrients in Fertilizers
      -10 Fertilizer Terms
      -11 Ammonia - Starting Point of Most "N" Fertilizers
      -12 How Much Fertilizer is Enough?
      -13 Conditions for Split Application of Nitrogen
      -14 Factors Influencing Fertilizer Rates
      -15 Proper Fertilization
      -16A The Principle of Dimishing Returns
      B Conversion Factors

SOIL ACIDITY AFFECTS THE AVAILABILITY OF MOST NUTRIENT ELEMENTS

T VANTREESE, INST MATL LAB., U.K.

102-4-1

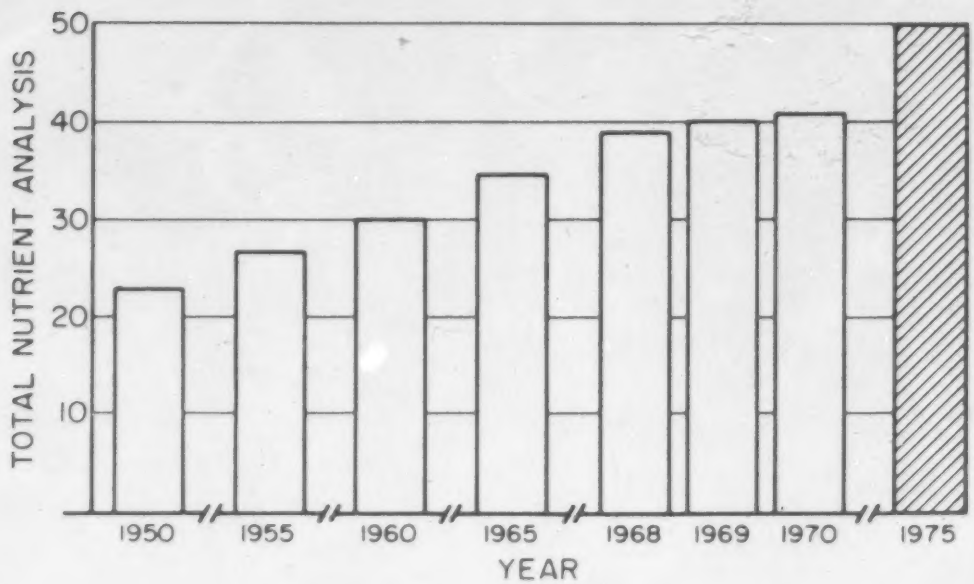
PLANT FOOD UTILIZATION BREAKDOWN BY SPECIFIC CROPS

CROP	YIELD	Pounds per Acre N	P_2O_5	K_2O	Mg	S
Corn	180 bu grain	170	70	48	16	14
	8000 lb stover	70	30	192	34	16
Wheat	80 bu	144	44	27	12	5
	6000 lb straw	42	10	135	12	15
Oats	100 bu	80	25	20	5	--**
	Straw	35	15	125	15	--**
Barley	100 bu	110	40	35	8	10
	Straw	40	15	115	9	10
Grain Sorghum	8000 lb grain	120	60	30	14	22
	8000 lb stover	130	30	170	30	16
Tobacco (flue-cured)	3000 lb leaf	85	15	155	15	12
	3600 lb stalks, tops, suckers	41	11	102	9	7
Tobacco (burley)	4000 lb leaf	145	14	150	18	24
	3600 lb stalks, tops, suckers	95	16	114	9	21
Soybeans*	60 bu	252	49	87	17	12
	7000 lb stalks, leaves, pods	84	16	58	10	13
Apples	600 boxes (42 lb)	20	8	50	2	--**
	blossom, fruit, new wood	80	38	130	22	--**
Peaches	600 bu	35	10	65	--**	--**
	tree annually	60	30	55	--**	--**
Grapes	12 T fruit	66	23	120	--**	--**
	vines	36	12	36	--**	--**
Tomatoes	40 T fruit	144	67	288	10	28
	4400 lb vines	88	20	175	26	26
Potatoes	500 cwt	150	80	264	12	12
	vines	102	34	90	20	12
Snap Beans	4 T	70	21	77	8	--**
	Plants	68	12	86	9	--**
Cucumbers	10 T	40	14	66	4	--**
	vines	50	14	108	21	--**
Lespedeza*	3 T	150	50	150	25	20
Bluegrass (turf)	3 T	200	55	180	20	25
Tall Fescue	3.5 T	135	65	185	13	--**

Legumes can get most of their nitrogen from the air.
**Figure unavailable.

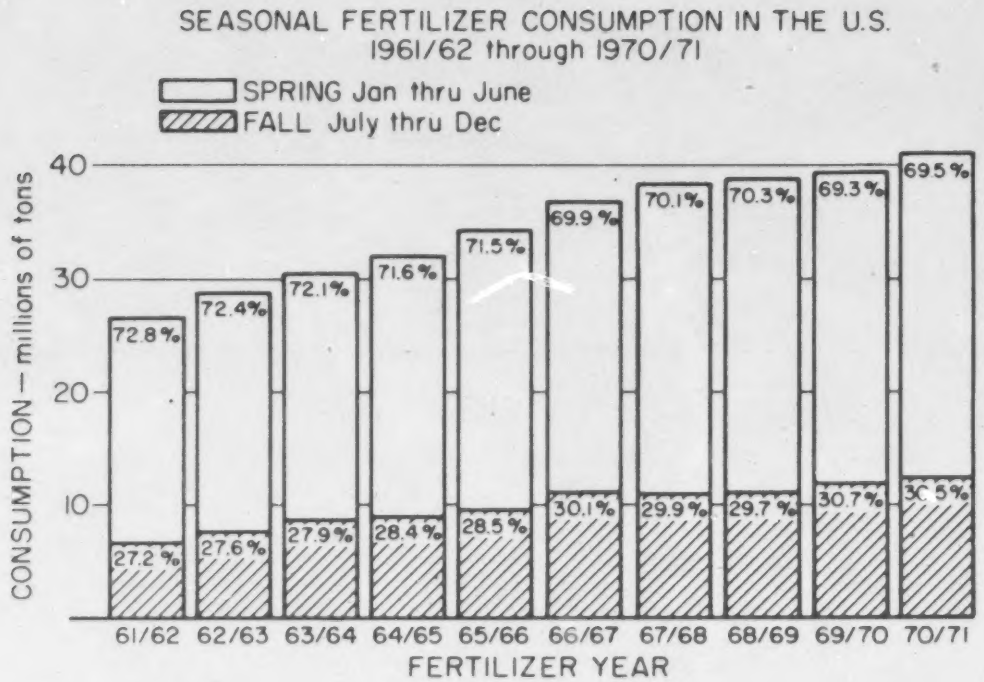
SOURCE: American Potash Institute 102-4-2

AVERAGE NUTRIENT ANALYSIS OF TOTAL FERTILIZER CONSUMPTION IN SELECTED YEARS



Source: American Potash Institute

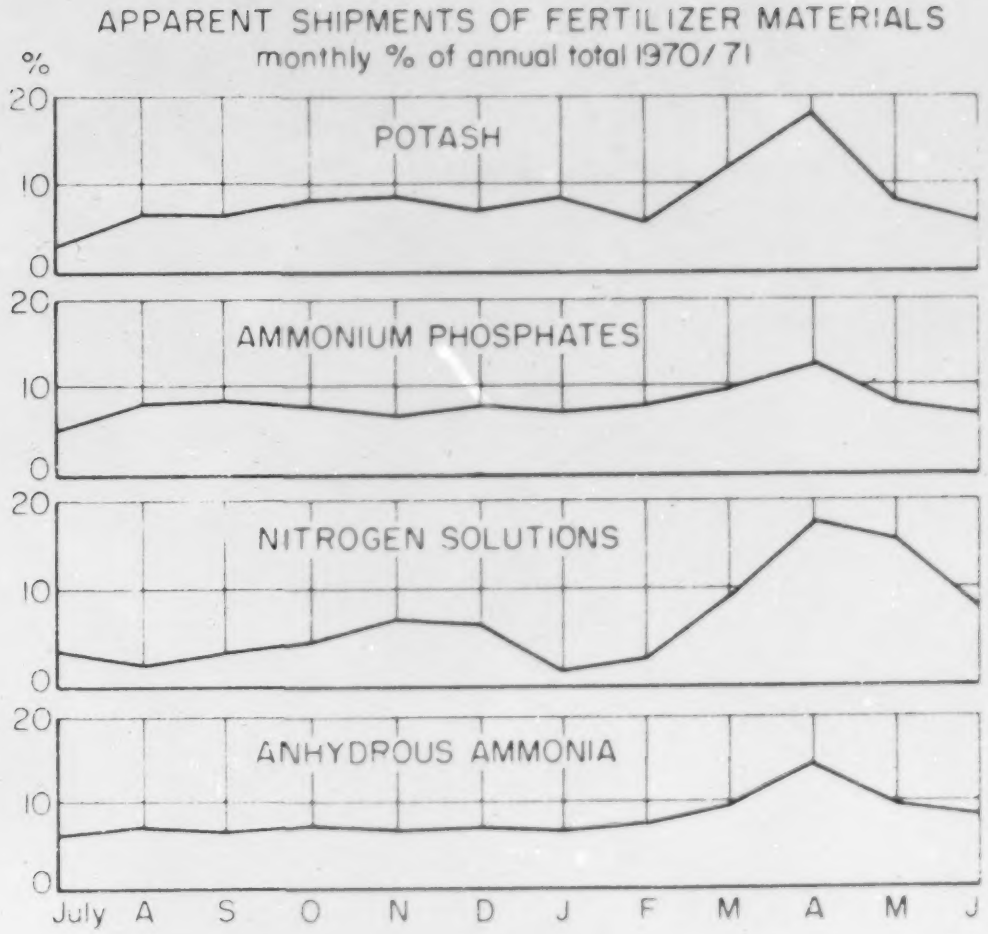
102-4-3



U.S. SEASONAL CONSUMPTION

Source: American Potash Institute

102-4-4



Source: American Potash Institute

102-4-5

PAGE 66-69 OF THIS DOCUMENT WAS REMOVED PRIOR TO ITS BEING SUBMITTED TO THE ERIC DOCUMENT REPRODUCTION SERVICE BECAUSE IT WOULD NOT REPRODUCE IN MICROFICHE.

THE WEAKEST LINK

Source: FERTILIZERS -- PRODUCTS OF MODERN CHEMISTRY

Nutrients In Fertilizers

PRIMARY

N	**Nitrogen**
P	**Phosphorus** In Fertilizer—Phosphate—P_2O_5
K	**Potassium** In Fertilizer—Potash—K_2O

SECONDARY

Ca	**Calcium**
Mg	**Magnesium**
S	**Sulfur**

83

MICRONUTRIENTS

B	**Boron**
Cu	**Copper**
Fe	**Iron**
Mn	**Manganese**
Mo	**Molybdenum**
Zn	**Zinc**
Cl	**Chlorine**

102-4-9

Source: FERTILIZERS -- PRODUCTS OF MODERN CHEMISTRY

FERTILIZER TERMS

FERTILIZER GRADE

The guaranteed analysis, in percentages, of $N\text{-}P_2O_5\text{-}K_2O$.

Examples: 10-10-10 and 5-10-15

FERTILIZER RATIO

Ratio of two or more nutrients to another

Examples: 10-10-10 **grade** has a 1-1-1 **ratio.**
5-10-15 **grade** has a 1-2-3 **ratio.**

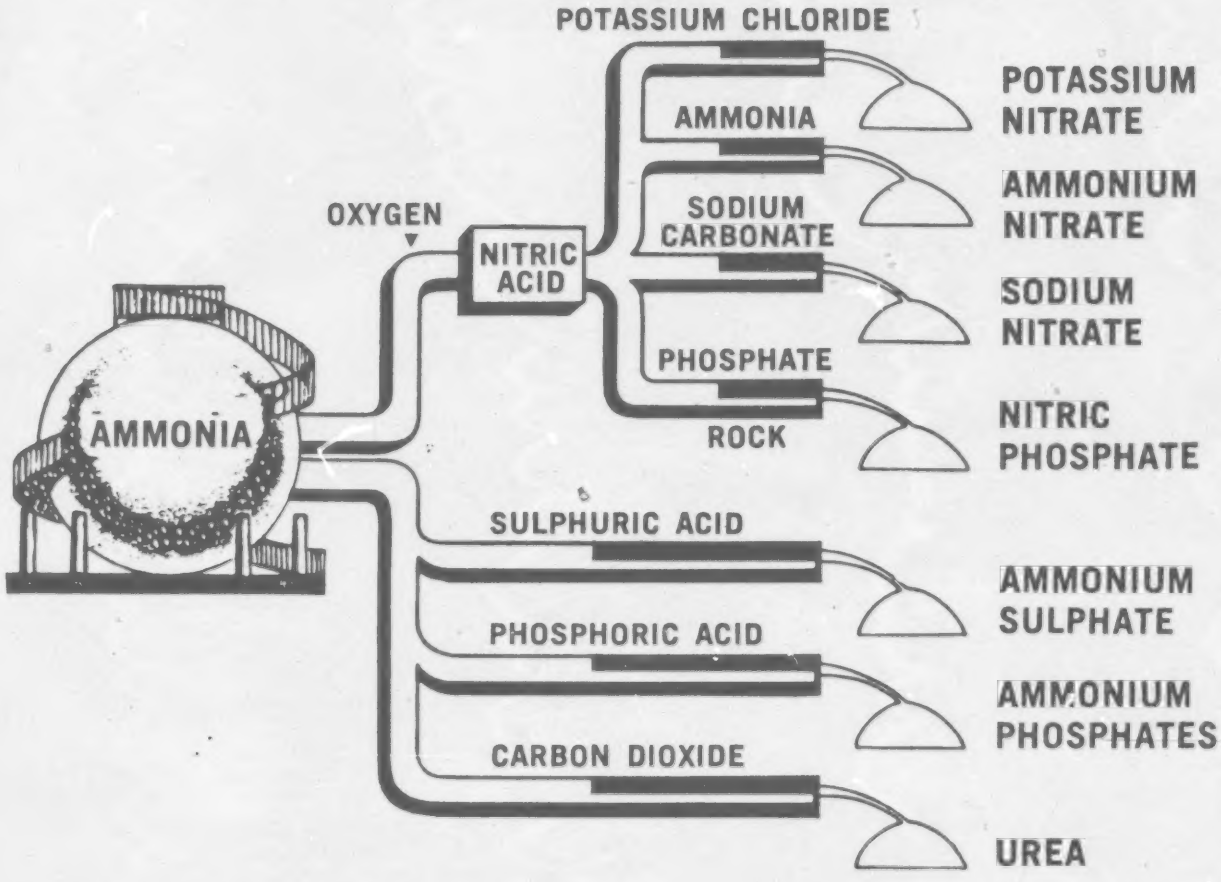
FERTILIZER MATERIAL

A fertilizer containing one or more plant nutrients just as produced.

Examples: Nitrogen—ammonium nitrate
Phosphate—superphosphate
Potash—muriate of potash
Secondary—gypsum or land plaster
Micronutrient—borax

Source: FERTILIZERS -- PRODUCTS OF MODERN CHEMISTRY

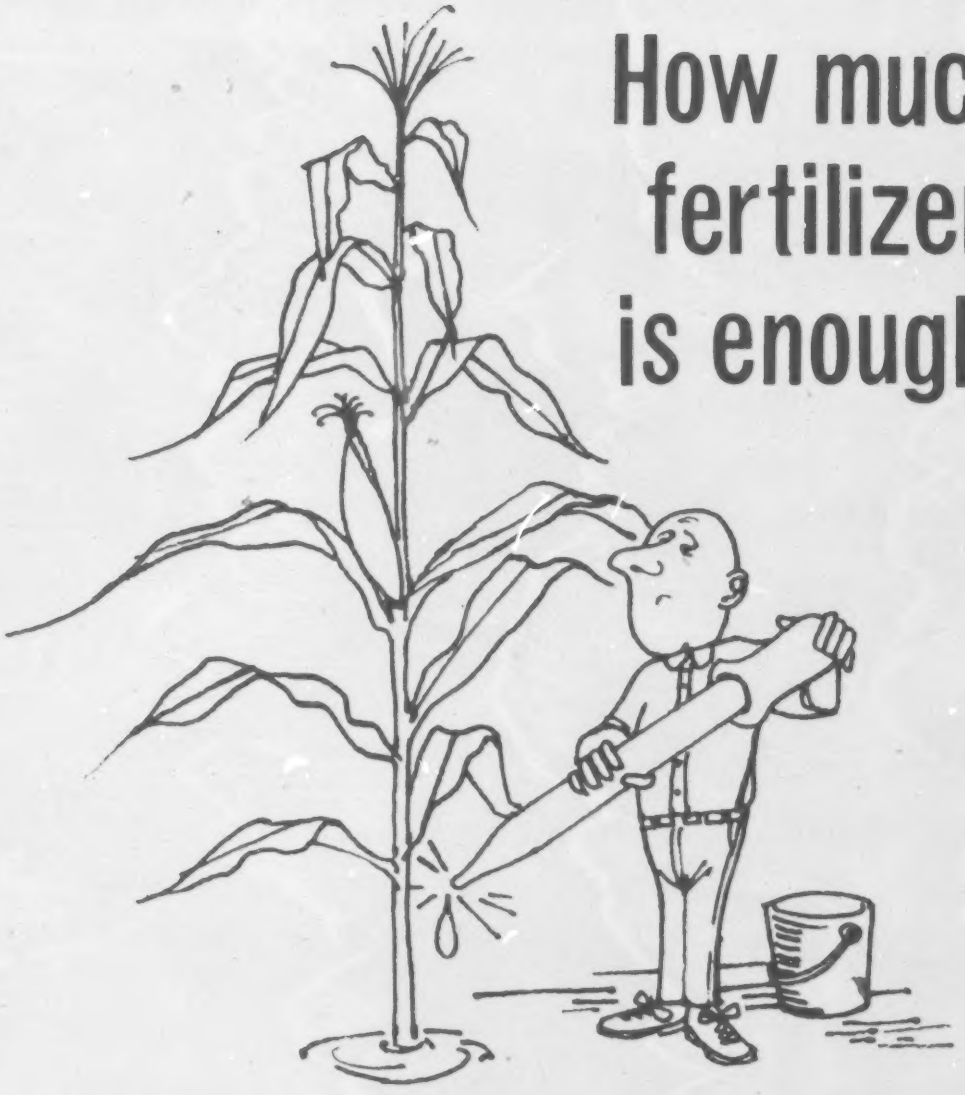
Ammonia is the Starting Point for Most Nitrogen Fertilizer



$$N_2 + 3H_2 \rightarrow 2NH_3$$

(Nitrogen) (Hydrogen) (Ammonia)

Source: FERTILIZERS - PRODUCTS OF MODERN CHEMISTRY

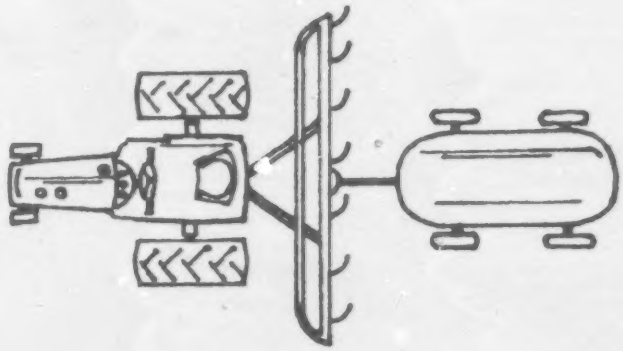


102-4-12

Source: VoAg Visuals, New Holland Co.

What conditions may encourage a split application of nitrogen ...

1. Rates over 200 pounds per acre
2. Yield goals over 150 bushels per acre
3. Early planted corn
4. Stands of 20,000 plants per acre
5. Excellent Weed Control
6. Good Moisture Reserve
7. Type of Soil



102-4-13

Source: VoAg Visuals, New Holland Co.

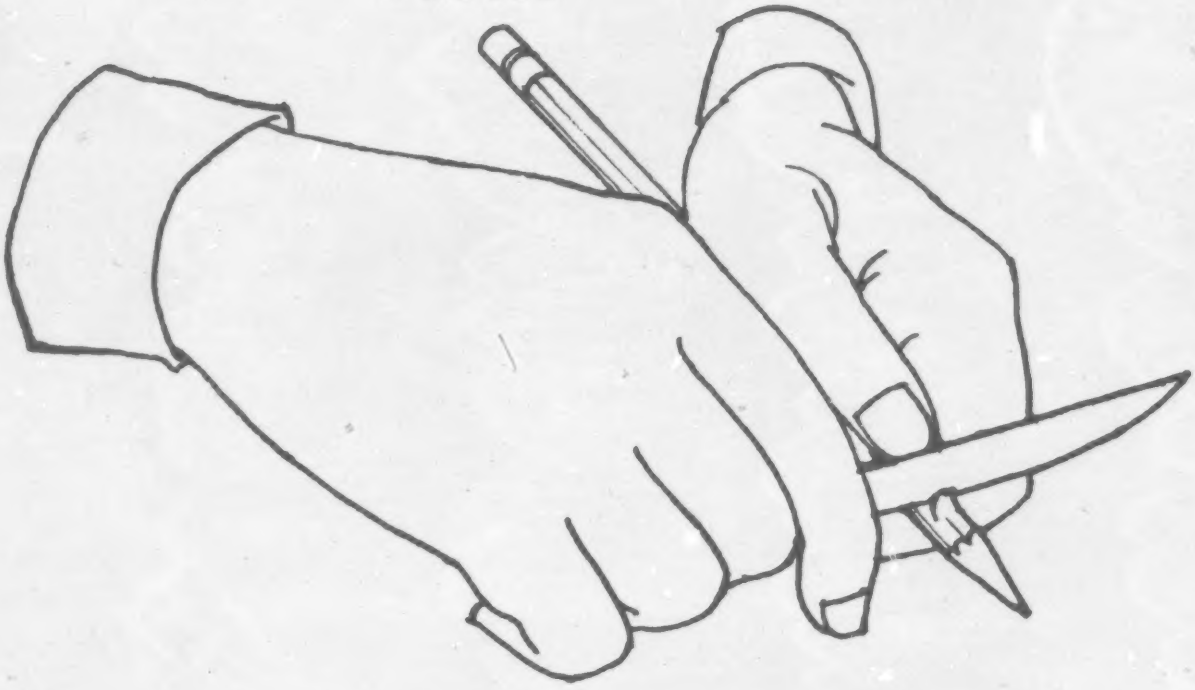
Factors influencing fertilizer rates..

Crop Variety 1	Yield Goal 2	Planting Date 3
Soil Type & Condition 4	Harvesting Method 5	Amount of Rainfall 6
Weed Control Methods 7	Present fertility level 8	Man in Management 9

102-4-14

Source: VoAg Visuals, New Holland Co.

Sharpen your profit pencil with

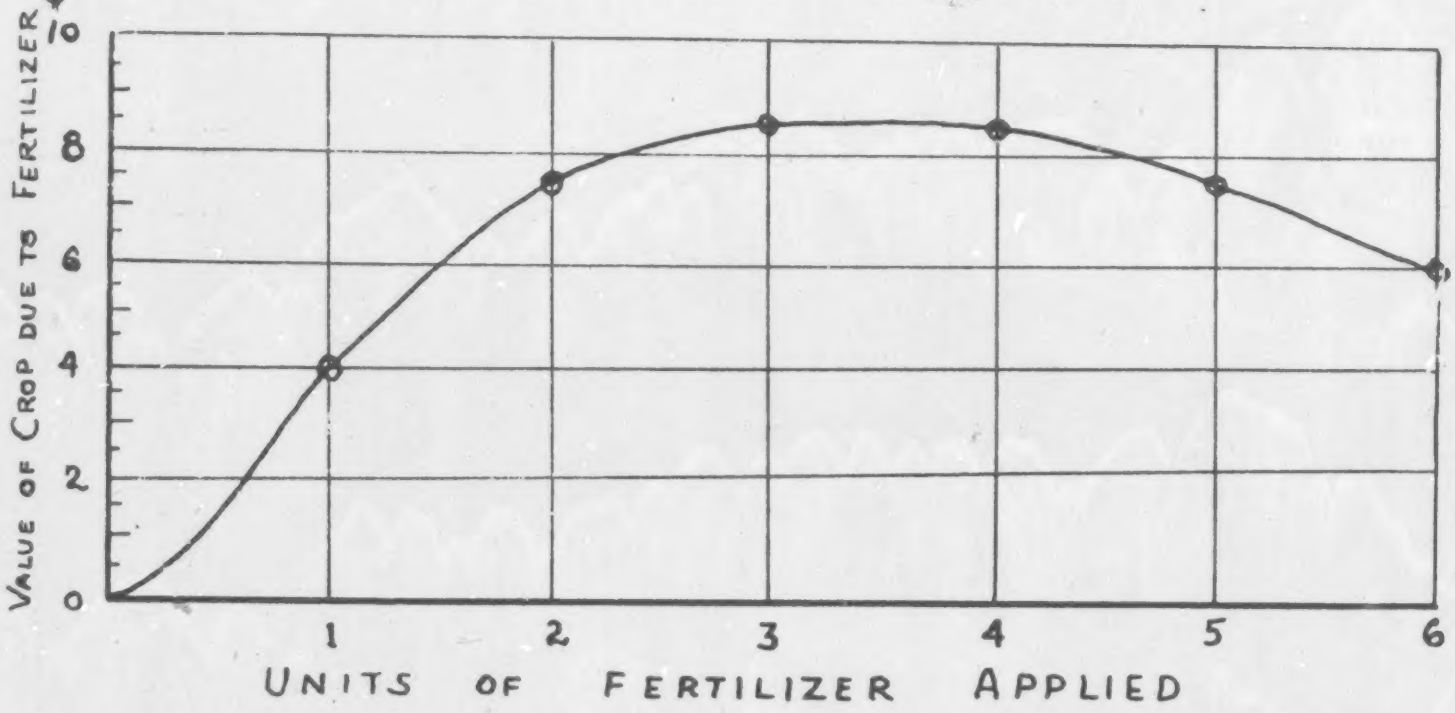


proper fertilization

102-4-15

Source: VoAg Visuals, New Holland Co.

The principle of diminishing returns is shown in the graph below.



102-4-16A

Conversion Factors

To Convert : P_2O_5 to P -- Multiply % P_2O_5 by .44 = % P

K_2O to K -- Multiply % K_2O by .83 = % K

P to P_2O_5 -- Multiply % P by 2.3 = % P_2O_5

K to K_2O -- Multiply % K by 1.2 = % K_2O

102-4-16B

Lesson 5

SELECTION OF PRODUCTIVE PROGRAMS BASED ON WISE LAND USE

Objective -- To develop the ability to select productive programs based on wise land use.

Problem and Analysis -- How can we select productive programs based on wise land use?

-Physical forces present on the farm
-Points to consider in choosing a cropping system
-Management decisions in the cropping system
-Adding livestock to a farming unit
-Factors in choosing livestock
-Livestock risk ratings
-Making a farm plan

Content

Introduction

The nation's biggest conveyor belt is the one that spans from the farmer to the consumer. Each year he handles about 1,500 pounds of food per person and his total goods and services are valued at $130 billion. In a single year farmers and ranchers furnish the food assembly line with about 11 million sheep and lambs, 39 million beef cattle and calves, 94 million hogs, 120 million turkeys, 3 billion broilers, 72 billion eggs, 115 billion pounds of milk and many other products. The total value at the farm level is about $50 billion. This much farm output requires about 1.3 billion acres of land.

The farmer of 1850 fed only 4 people besides himself. The farmer of 1960 fed 26 people, but the farmer of 1970 feeds 46 people. Even more significant is the rate of increase in output per farm worker since 1950--almost double that of nonfarm workers.

We know we have made progress in improving the quality of life for every member of our society, but has the efficiency of our farming operation reached its peak or may we improve it by

better selecting crop and livestock programs based on wise land use?

I. Physical Forces Present on the Farm

A. Use of soil survey report
1. Soil associations - major and minor soils
2. Slope, depth, stoniness, or natural drainage
3. Soil series
4. Location of good-sized areas suitable for certain kind of farming or other land use
5. Past cropping and livestock program

B. General aspects of land: topsoil, available water, lay of land, row crops, pasture crops, and available labor.

II. Points to Consider in Choosing a Cropping System

A. Nature and suitability of soils for crop production

B. Maximum acreage of the most profitable crop

C. The necessary livestock feed

D. Sequence of crops

E. Seasonal distribution in use of labor and equipment.

III. Management Decisions in the Cropping System

A. Selecting the high-income crops

B. Choosing a crop rotation suitable for the land and livestock (use not abuse)

C. Planning the field layout

D. Managing pastures, row crops and hay crops

E. Planning the fertilizer program

IV. Adding Livestock to a Farming Unit

A. Livestock can provide a more even distribution of labor and income

B. They can reduce the risk of the farming unit and make more complete use of resources.

C. Livestock usually help maintain and increase soil fertility.

D. Livestock turn low value forage into high value meat.

V. Factors in Choosing Livestock

A. The skill of the operator and ability to bear risk.

B. The labor supply and capital available

C. The size of farm, kind and quality of the soil resources

D. The feed supply and market availability

VI. Livestock Risk Ratings

A. High risk projects
1. Finishing heavy feeder steers
2. Finishing feeder lambs
3. Finishing plain steers
4. Producing turkeys

B. Moderately high risk projects
1. Finishing medium weight feeder steers or heifers
2. Wintering, grazing, and finishing calves
3. Wintering stock calves
4. Finishing feeder pigs

C. Moderately low risk projects
1. Wintering and grazing stock calves
2. Laying flocks

D Low risk projects
1. Producing feeder pigs
2. Producing stock calves
3. Producing creep-fed calves
4. Sow and litter
5. Dairy

VII. Making a Farm Plan

A. Develop a plan for the most profitable use of your land.

B. Use your land-capability map as a guide to decide on crops, rotations, field lay-outs and carrying capacity of livestock.

C. Know your land and decide what it can do.

Suggestions for Teaching the Lesson

I. Developing the Situation

A. Things to be brought out by the teacher:
1. The selection of the correct key crops to grow on a particular farm is of utmost importance. This will tend to bring in focus the complementary and supplementary crops.
2. Should we decide on our crops and then add livestock to the farming operation?
3. One of the difficult jobs in selecting crops and/or livestock programs is organization of them to bring about even demand for labor. The same principle is important in utilizing machinery and other factors of production.
4. A farm plan can be the most profitable undertaking during the entire year.
5. There will always be likes and dislikes for certain types of livestock and crop production by some farmers.

B. Things to be brought out by the class members:
1. Crops and livestock they now have on their farms.
2. Changes they have made in their farming operation within the last eight years.
3. Listing of high-, medium-, and low-risk livestock enterprises within the community.
4. The number of animals on their farms. The carrying capacity of animals per acre.
5. Difficulties they have with their present crop and/or livestock programs.

II. Conclusions

A. Physical factors of the land will greatly affect our cropping and livestock systems. The most important will be the slope of land, soil type, depth, drainage, and past cropping system.

B. The choice of a crop should be based upon the suitability of the land for specific crops, the expected yield, price, costs, risk involved, and the effect of the crop on the land.

C. Farmers should have maximum acreage of the most profitable crops, the necessary livestock feed, and a seasonal distribution in use of labor and equipment.

D. Livestock can provide a more even distribution of labor and income, reduce the risk of farming, and help maintain the soil fertility.

E. The higher our management ability the higher risk rating we will want to take in our livestock enterprise if this will fit our crop pattern.

F. Decisions and program plans should be put down in writing to enable the farmer to reach farming goals easier.

III. Enrichment Activities

A. Use a sample farm in the community as a class project. Select the crop and/or livestock system for this farm.

B. Invite a commercial farm manager to discuss crop and/or livestock systems and their effect on farm income, capital requirements, labor supply, and farm profits.

C. Determine the crop rotations practiced in the community.

D. Have a class member tell of his experiences with no-till farming.

IV. Suggested Teaching Materials

A. References for Lesson 5
   1. Farm Management Principles, Budgets, Plans, Chapters 5 and 6.
   2. Farm Management Teaching Unit, Chapter 3.
   3. Profitable Soil Management, Chapter 21.
   4. Soil and Water Conservation Plays Dividends.
   5. The Farm Mangement Handbook, Chapter 8 and 9.

B. Resource Personnel
   1. Local County Extension agent
   2. Successful farmers in your class
   3. Farm managers in the area
   4. Staff member of a State college or university
   5. For specific personnel, see the VoAg Directory of Resource People in Kentucky

C. Audio-visuals
   1. Masters
      -1 Who's Supporting Who?
      -2 Management Decisions in the Cropping System
      -3 Preliminary Steps in Selecting a Cropping System
      -4 What Factors Influence Choice of Crop?
      -5 Choosing Livestock Enterprises that Fit Your Farm
      -6 Factors in Choosing Livestock
      -7 Why Add Livestock to a Farming Unit?
      -8 Planning Land Use
      -9 Match Production Potential
      -10 Match Energy Production
      -11 Capability for Energy Production
      -12 Manage the System
      -13 Value of a Forage Program
      -14 Increase Forage Production
   2. Films (Division of Conservation, Frankfort, Kentucky)
      a. "Know Your Land," USDA, 10 min. Color, Shows land classification.
      b. "Living Earth Series," 4 parts, 10 min. each, Color
         1) "Birth of the Soil"
         2) "The Vital Earth"
         3) "Arteries of Life"
         4) "Seeds of Destruction"

WHO'S Supporting WHO?

Note how the farmer's production load has increased—he's added 20 since 1960.

WES RITCHIE in
FARM PROFIT Magazine

1850
He fed 4

1900
He fed 7

1940
He fed 11

1960
He fed 26

1970
He fed 46

Source: Better Crops with Plant Food, 102-5-1
Potash Institute of North America

MANAGEMENT DECISIONS IN THE CROPPING SYSTEM

1. Selecting the high-income crops.

2. Choosing a crop rotation* suitable for the land and livestock.

3. Planning the field layout.

4. Managing pastures.

5. Planning the fertilizer program.

*Crop rotation is still sometimes advisable although not as widely practiced as it was ten or twenty years ago.

PRELIMINARY STEPS IN SELECTING A CROPPING SYSTEM

1. Determine areas that are steep and rocky and should be used for forest land.

2. Delineate those areas which should be used for permanent pasture.

3. Determine the number of rotations for the tillable land.

WHAT FACTORS INFLUENCE CHOICE OF CROP ?

Motive, and Suitability of Soils

1. The expected yields.

2. The price.

3. The landlord's share and costs.

4. The risk involved.

5. The effect of the crop on the land.

CHOOSING LIVESTOCK ENTERPRISES THAT FIT YOUR FARM

	DAIRY	SHEEP	BEEF COW	BEEF	FEEDER PIG	HOG
Unit	Milk Cow	Ewe	Cow	Cow	Sow	Sow
Production	12,500#M.	90# Lamb 120% Lamb Crop 8# Wool	450# Calf 90% Calf Crop	950# Beef	14 Pigs 40#	14 Market Hogs
Feed[1]						
Corn	50 bu.	4 bu.	4 bu.	44 bu.	40 bu.	205 bu.
Hay	7200#	800#	4500#	6500#	------	-------
Pasture	1.7 Acre	.26 Acre	1.7 Acre	1.7 Acre	.67 Acre	.67 Acre
% Land[2] in						
Corn	15%	9%	2%	14%	37%	75%
Hay	33%	29%	28%	31%	---	---
Pasture	52%	62%	70%	55%	63%	25%
Hours Labor	80	4	13	23	15	3
Capital	$1750	$150	$790	$1226	$750	$1500
Gross	$575	$25	$110	$195	$227	$500
Net	$172.50	$7.50	$33	$46.75	$56.75	$125
Units to = $6000 Net	35	800	182	123	106	48

[1]Pasture is alfalfa and grass, untreated permanent pasture would require 3 times as many acres, fertilized and limed pasture permanent 1½ times as many acres.

[2]Yields used were corn 100 bu., hay 3.3 tons, pasture .75 animal units.

Source: "Profit-Maximizing Principles," Ohio Ag Education Curriculum Materials Service 102-5-5

FACTORS IN CHOOSING LIVESTOCK

1. The skill of the operator.

2. The labor supply.

3. The capital available.

4. The feed supply.

5. The size of the farm.

6. The kind and quality of the soil resources.

7. The operator and manager's ability to bear risk.

8. The buildings available on the farm.

9. The special marketing advantages.

WHY ADD LIVESTOCK TO A FARMING UNIT?

1. To provide a more even distribution of income.

2. To reduce the risk.

3. To make more complete use of resources.

4. To help maintain soil fertility.

PLANNING LAND USE

1 - Benchmark the land resource

2 - Establish field boundaries

3 - Benchmark fertility level of fields

4 - Establish objectives for use of land

5 - Plan cropping system

Develop Livestock Enterprise(s)
to do best job of utilizing crop production
(as related to land use objectives)

Source: Dr. Kenneth Wells, U of K.

MATCH Production Potential of Crop

TO

Production Potential of Land (field)

Source: Dr. Kenneth Wells, U of K.

102-5-9

MATCH energy production potential to LAND QUALITY to get top production of forages.

Source: Dr. Kenneth Wells, U of K.

CAPABILITY FOR ENERGY PRODUCTION

CROP	Est. % TDN	1969 Av. Ky. YIELD (T/A)	Lbs TDN/A
Corn Silage	20	15	6,000
Alfalfa Hay	50	3	3,000
Clover-grass pasture	50	2	2,000

Source: Dr. Kenneth Wells, U of K.

MANAGE THE SYSTEM

--poor management masks out effect of Agronomic Technology

--Don't waste time and money if its not going to be used

--Utilization of forages is as important to the economics of the system as application of Agronomic Technology

Source: Dr. Kenneth Wells, U of K.

102-5-12

1 ACRE OF GRASS-LEGUME FORAGE[1]
(6-Yr. Av.)

Management System	No. Days Feed for 700 lb. Yrling.	Lbs. Liveweight Gain per Acre
1. Continuous grazing	223	306
2. 12-month forage program	384	432
a. Controlled grazing	188	236
b. Silage and hay	196	196
% increase over continuous grazing	72	41

[1] V.P.I. Res. Div. Bul. 45, 1969.

Source: Dr. Kenneth Wells, U of K.

102-5-13

INCREASING FORAGE PRODUCTION

--Allocate Land To Its Best Use

--Lime and Fertilize

--Double Crop When Possible

--Manage Fields Intensively

Source: Dr. Kenneth Wells, U of K.

Lesson 6

SOIL AND WATER CONSERVATION

Objective -- To develop the effective ability of farmers to understand soil and water conservation.

Problem and Analysis -- What are our soil and water conservation problems?

-Soil erosion
-Causes and effects of man-made erosion
-Importance of soil and water conservation
-Types of erosion

Content

Introduction

Conserving land resources is very important to the future of a nation and its population. It has often been said that the real goal of soil and water conservation is increasing the supply of food.

Widespread waste of our nation's precious soil and water resources today raises the question of whether or not we can continue to feed and clothe our mushrooming population at today's high standards and at a reasonable cost.

In years to come, we are sure to need every acre of productive land and every gallon of economically available water if we are to feed and clothe our population at today's high standards. Our number of people is expected to reach the 273-million mark by 1980, and the number of mouths we must feed may be even doubled by the end of the century. Today, we are faced with the problem of conserving our soil and water resources so that we can feed and clothe our children and our grandchildren 25 or 50 years from now.

Planning and acting together today for sound land use and better water management will do more than improve yields and boost farm income. The soil and water conserved today will be invaluable, if not vital, to the welfare of our nation tomorrow.

Soil and water conservation truly is a "must" if we are to keep this a land of plenty.

I. Soil Erosion (the movement of soil particles from one place to another under the influence of water or wind)

A. Geological erosion is the effect of working forces such as volcances, earthquakes, slow rising and sinking of vast land masses, and other great movements, by which rock is broken up into soil. It is produced by natural forces working on the surface of the earth. Factors include frost, gravity, soil, air and water, plant roots, wind, raindrops, streams, waves, and glaciers. (Geological erosion never stops, but it works so slowly in terms of human time that we speak of it as stabilized.)

B. Man-made erosion. When man cuts down the trees, plows up the soil, grazes the plains on stabilized lands, the protective cover is destroyed and man-made erosion becomes uncontrolled; our water resources are also menaced by dropping water tables, polluted streams silting reservoirs, and increasing water demand in combination with decreasing supplies. Water shortages are already hampering American growth.

C. The National Environmental Policy Act, signed into law on January 1, 1970, established a national policy to "maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans. The main functions of EPA are: air pollution control, clean water, solid waste management, radiation, pesticides, and noise. These are all man-made ills on which we must all work together for our environmental protection. (See masters 8 and 9.)

II. Causes and Effects of Man-Made Erosion

A. Causes of man-made erosion
1. Plowing soil too steep for cultivated crops

2. Plowing soil in areas with too little rainfall to support continuous crop production
3. Breaking up large blocks of land susceptible to erosion
4. Failing to maintain crop residues on the surface while the soil is not protected by growing crops
5. Exposing soil on slopes
6. Removing natural vegetation from forest lands
7. Reducing and weakening plant growth by overgrazing

B. Effects of man-made erosion
1. Loss of the best part of the soil
2. Reduction of crop yields
3. Need for greater use of plants and commercial fertilizers
4. Production of less-nutritious crops
5. Formation of gullies
6. Covering of rich bottomlands by soils from poorer high lands
7. Destruction of roadbanks and removal of bridges
8. Erosion by stream banks of valuable bottomlands
9. Silting of ditches, streams, dams, lakes and reservoirs
10. Reduction of community income
11. Increase in flood hazards
12. Waste of water that could be used for other purposes

III. Importance of Soil and Water Conservation

A. Of the earth's total surface area approximately one third is land and approximately two thirds is water.

B. In the United States, we have almost 2.3 billion acres. Only 1.2 billion acres are capable of producing crops or used for pasture. The rest of our land is used for forests, highways, homes, wastelands, parks, etc.

C. We have slightly over two tillable acres per person in the United States.

D. Wind and water erosion cause a loss of soil pro-

ductivity. It has been estimated that nature spends from one hundred to four hundred years in developing one inch of usable topsoil. Just a few minutes of serious wind or water erosion can destroy many years of nature's slow work in establishing a soil.

E. Loss due to water erosion each year. Nearly 4 billion tons of sediment are delivered to our waterways each year, the equivalent of 4 million acres of topsoil. We can assume that at least 75% of this mass is derived from agricultural and forested lands and that it will have an average analysis of 0.10 percent nitrogen, 0.15 percent P_2O_5, and 1.50 percent K_2O. This means that more than 50 million tons of primary nutrients are lost from our agricultural and forested lands each year through sediment delivery.

F. The combination of water picked up by the atmosphere in the form of vapor and sent back to earth is a continuous cycle called water cycle. (See masters 2 and 3.) When all aspects of the water cycle are considered we can see that our total water supply is constant, merely existing in different forms.

IV. Types of Erosion

A. Splash erosion. Single drops of rain fall (See master 4.) with great force, thus breaking up soil aggregates and resulting in movement of the small particles.

B. Sheet erosion. Soil is removed in fairly uniform amount over a large surface. (See master 5.)

C. Rill and gully erosion. A concentrated force of water moving large amounts of soil down the slope. (See masters 5 and 6.)

D. Wind erosion is serious on light or sandy soils, but usually can be prevented by using a good cover crop or establishing field windbreaks. (See master 7.)

Suggestions for Teaching the Lesson

I. Developing the Situation

A. Things to be brought out by the teacher:
1. Soil is a thin layer of material which covers most of the earth's land surface. It is composed of minerals, organic matter, water, air, and living organisms and supports plant life. (See master 1.)
2. The soil serves as a basis for our nation's strength and prosperity.
3. An otherwise productive soil that does not receive adequate moisture will be seriously limited in its ability to produce. For example, from 20-22 inches of rain are required during the growing season to produce a crop of corn.
4. People responsible for correcting or protecting our environment. (See masters 8 and 9.)

B. Things to be brought out by the class members:
1. Types of erosion on their farms
2. Causes of erosion
3. Effects of erosion
4. Some good and poor practices of farming in the community that affect soil productivity

II. Conclusions

A. Our greatest soil- and water- conservation problems are caused by people in the neglectful use of our land. The movement of soil particles from one place to another under the influence of water or wind is a national menace.

B. There isn't anything that we can do about geological erosion.

C. These steps would be helpful in controlling man-made erosion.
1. Stop plowing soil too steep for cultivated crops.
2. Stop plowing soil in areas with too little rainfall to support continuous crop production.
3. Stop breaking up large blocks of land susceptible to erosion.

4. Stop exposing soil on slopes.
5. Stop removing natural vegetation from forest lands.
6. Stop overgrazing.
7. Emphasize that it is everyone's job to control man-made erosion in our environment. (See master 10.)

III. Enrichment Activities

A. Use the Soil Conservation Service to tell about general productivity of soils and soil tilth of the community.

B. Take a field trip to places of severe erosion. Show good examples of splash boards. Point out sheet, rill, gully and wind erosion.

C. Study the effect of soil erosion and depletion on local crop yields.

D. Use a good young or adult farmer to tell of experiences on his farm of soil and water conservation problems.

E. Use State Extension Soil specialists.

F. Show slides of recent rain or wind storms in the community.

IV. Suggested Teaching Materials

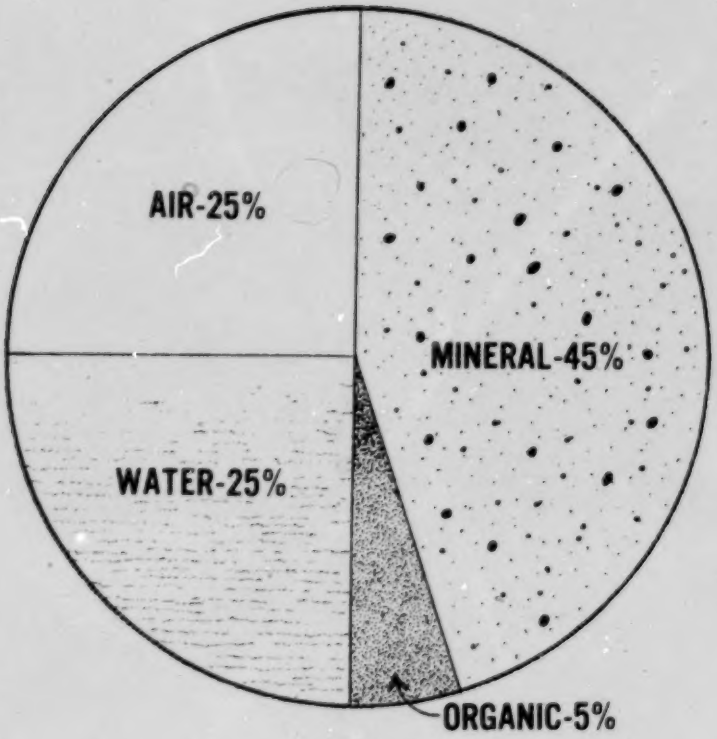
A. References for Lesson 6

1. Conservation and the Water Cycle, Agriculture Information Bulletin No. 326.
2. Land - Yearbook of Agriculture 1958, pp. 316-332.
3. Profitable Soil Management, Chapter 17.
4. Soil and Water Conservation, AGDEX 963, Ohio State University.
5. Teaching Soil and Water Conservation, USDA, PA341.
6. Water - Yearbook of Agriculture 1955, pp. 121-159.
7. Key Soil and Water Conservation Needs Inventors, SCS, 1970.

B. Resource personnel
   1. Local SCS personnel
   2. State Extension specialists
   3. Good young or adult farmers of the community
   4. State Forestry Service personnel
   5. For specific personnel, see the VoAg Directory of Resource People in Kentucky

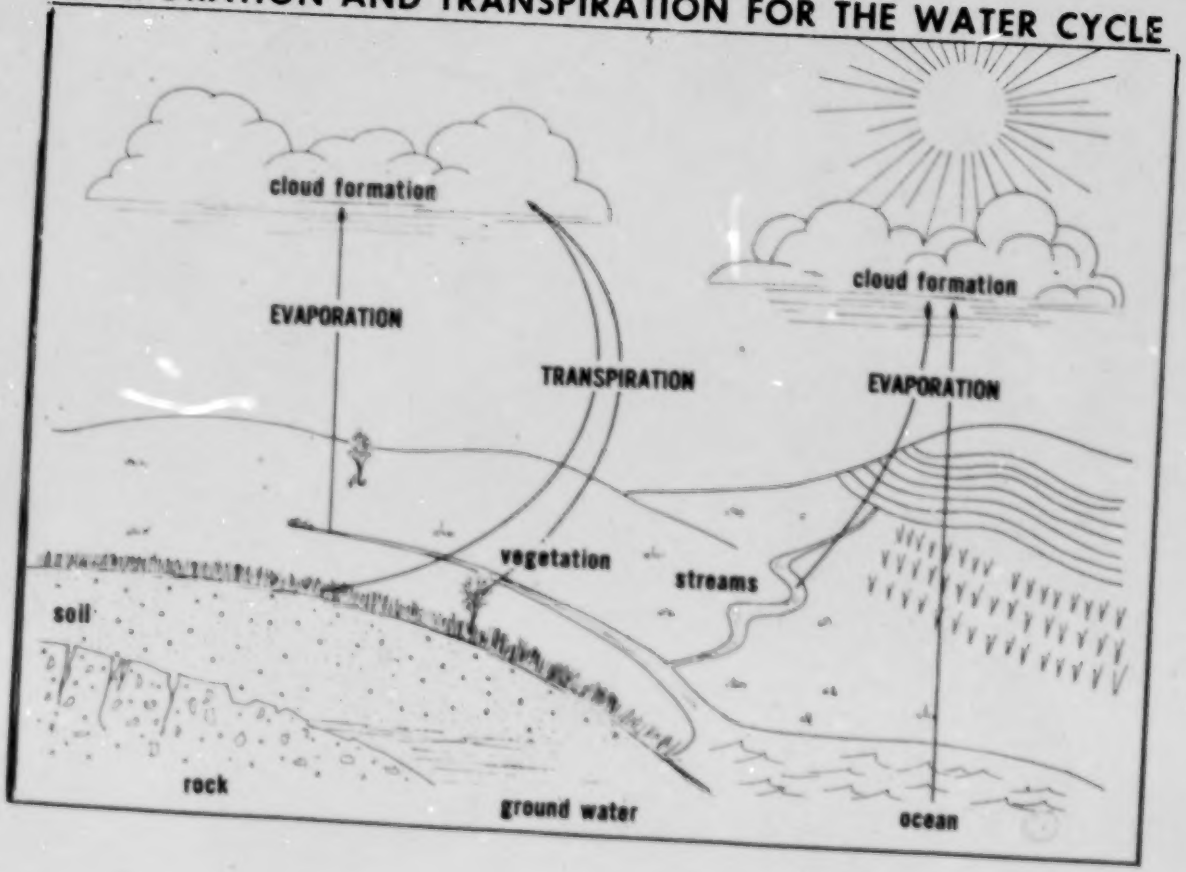
C. Audio-visuals
   1. Masters
      -1 Make-up of Soil
      -2 Evaporation and Transpiration for the Water Cycle
      -3 Precipitation from the Water Cycle
      -4 Splash Erosion
      -5 Sheet, Rill, and Gully Erosion
      -6 Gully Erosion
      -7 The Effects of Wind Erosion
      -8 Pulling Together for Environmental Protection
      -9A,B Matching
      -10 Everyone's Job
      -11 Factors in Soil Use
   2. Films (available on loan from the Division of Conservation, Frankfort, Ky.)
      a. "Clean Water," 24 min. Color
      b. "Conserving Our Soils," 11 min. Color
      c. "The People Together," 45 min. Color

MAKE-UP OF SOIL



SOURCE: Soil and Water Conservation, Ohio Curriculum Materials Service.

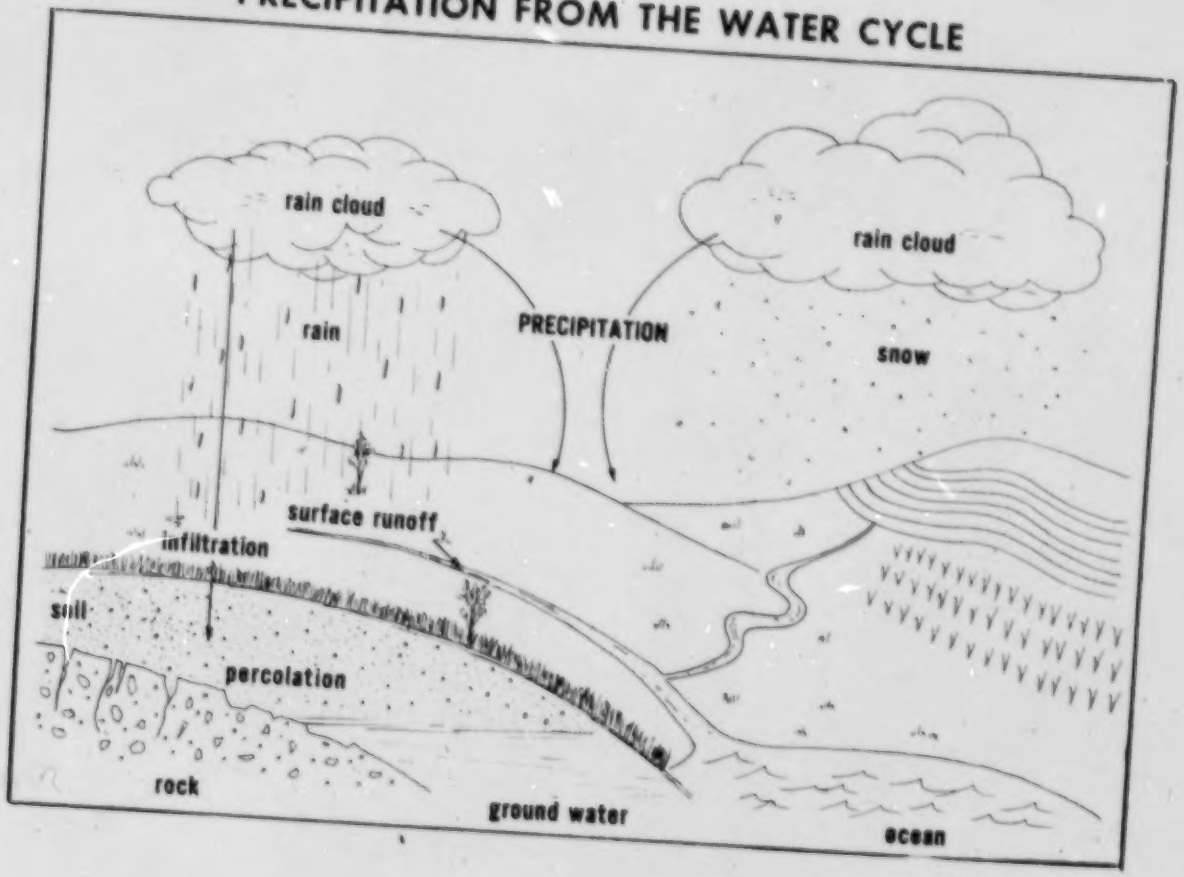
EVAPORATION AND TRANSPIRATION FOR THE WATER CYCLE



102-6-2

Source: Soil and Water Conservation, Ohio Curriculum Materials Service.

PRECIPITATION FROM THE WATER CYCLE

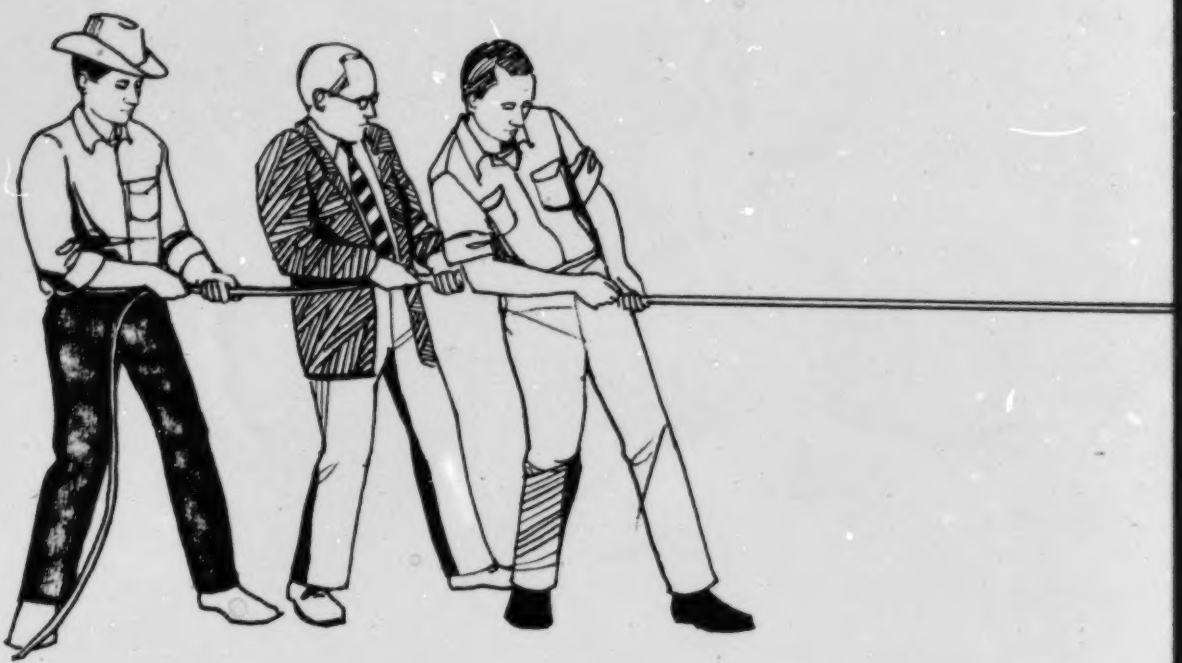


Source: Soil and Water Conservation, Ohio Curriculum Materials Service.

102-6-3

PAGE 110-113 OF THIS DOCUMENT WAS REMOVED PRIOR TO ITS BEING SUBMITTED TO THE ERIC DOCUMENT REPRODUCTION SERVICE BECAUSE IT WOULD NOT REPRODUCE IN MICROFICHE.

PULLING TOGETHER FOR ENVIRONMENTAL PROTECTION



SOURCE: Sperry Rand, New Holland Division, VoAg Visuals,

102-6-8

Matching

_____1. Soil erosion
_____2. Hard pesticide
_____3. SCS
_____4. Irrigation
_____5. Soil Survey
_____6. Modified tillage
_____7. Waste Disposal
_____8. Fertilizer
_____9. Environmental Protection Agency (EPA)
_____10. Terrace

A. Governmental agency
B. Stairsteps to stop erosion
C. Conservation plan
D. Pollutes rivers via soil erosion
E. Air, water and soil defender
F. Agriculture's biggest pollution problem
G. Expanding in southwest
H. Lingers in the soil
I. Farmers lead the cities
J. Trash is left on surface

SOURCE: Sperry Rand, New Holland Division, VoAg Visuals.

102-6-9A

KEY

F 1.
D&H 2.
A 3.
G 4.
C 5.
J 6.
L 7.
D&H 8.
A&E 9.

B 10.

SOURCE: Sperry Rand, New Holland Division, VoAg Visuals,

102-6-9B

Everyone's job

E_____ENGINEER
N_____NUCLEAR PHYSICISTS
V_____VETERINARIANS
I_____IRRIGATORS
R_____RESEARCHERS
O_____ORGANISTS
N_____NATIONAL FOREST RANGER
M_____MECHANICS
E_____EQUIPMENT SALESMAN
N_____NURSES
T_____TEACHERS
A_____AGRONOMISTS
L_____LAWYERS

P_____POULTRYMAN
R_____RANCHERS
O_____OIL MEN
T_____TRUCK DRIVER
E_____ELEVATOR MANAGERS
C_____CATTLEMEN
T_____TAXI DRIVERS
I_____INDUSTRIALIST
O_____ORCHARDIST
N_____NAVY

SOURCE: Sperry Rand, New Holland Division, VoAg Visuals.

FACTORS IN SOIL USE

SLOPE is the first factor to consider (Land Capability Class)

CAPABILITY UNIT of mapping units within same slope class is next thing to consider (capability to produce)

SIZE AND PROXIMITY of similar capability units is next thing to consider

102-6-11

Source: Dr. Ken Wells, U of K.

Lesson 7

SOIL AND WATER FOR RURAL USE

Objective -- To develop the effective ability of farmers to manage our soil and water for rural use.

Problem and Analysis -- How should we manage our soil and water for rural use?

-Management of grasslands
-Management of strip cropping
-Management of crop rotation
-Management of cultivated fields
-Management of forest lands
-Management of water

Content

Introduction

Terrestrial agriculture represents the process of harvesting solar energy in forms which can be used to support human and animal existence. In effect, agricultural producers derive their livelihood by harvesting solar energy and selling it in the form of a crop or livestock product to humans who do not produce their own food needs. The major way in which solar energy can be harvested is by growth of green plants.

Soils are a fixed resource, and very little can be done about their natural properties which affect crop growth. The systematic allocation of type of crop to available land resources on the basis of highest value crops being grown on best land, on down to lowest value crops being grown on poorest land is basic to developing a farming system for maximizing returns. Generally speaking, the cash value of cultivated crops is enough greater than forage crops that cultivation of all land capable of being cultivated represents land-use patterns which will maximize returns from crops. Maximum returns from the portion of rotation land not in cultivation usually comes from hay crops. Pasture crops represent best use of agricultural land which is unsuited for any cultivation.

Crops, landscape positions, and common land use hazards are very important in managing our soil and water for rural use.

I. Management of Grasslands

A. Grass is a very effective means of conserving soil and water.

B. Pasture and hay constitute the most important sources of cattle feed in Kentucky.

C. The area devoted to these crops is approximately 9.3 million acres, more than 4 times that used for producing corn, soybeans, small grains, grain sorghum, and tobacco.

D. Most grasslands in the state are producing far below their potential.

E. Master 1 shows diagrammatically some of the factors and interactions of factors involved in grassland farming.

F. To obtain the best results from grassland farming:
   1. Choose grasses and other pasture crops that provide a thorough cover of the ground and a fairly large leaf area to hold water and break the impact of raindrops.
   2. Provide conditions favorable to development of the pasture crop.
   3. Put lands used for a crop rotation into pasture often enough to maintain an adequate supply of organic matter.

II. Management of Strip Cropping

A. Strip cropping is a variation of grassland farming. Strips of sod or other close-growing crops are alternated with strips of cultivated crops.

B. Strip cropping is a management device with crop rotation and contour farming. This system depends on the ability of the strips to reduce the

velocity of wind and of water runoff, and to filter out the soil from cultivated areas.

C. Types of strip cropping are contour, field, wind, and buffer strip cropping.

D. Factors that determine width of strips include:
   1. Degree and length of slope
   2. Permeability of soil
   3. The soil's susceptibility to erosion
   4. The amount and intensity of wind and rainfall
   5. Kinds and arrangement of crops in the rotation
   6. The size of farm equipment

III. Management of Crop Rotation

A. Crop rotation is the growing of a selected number of different kinds of crops in regular order on any particular field.

B. Major testing has been on the Morrow Demonstration plots at the University of Illinois.
   1. The plots were established in 1876 to demonstrate the long-term effects of different cropping systems with and without soil treatments.
   2. The Morrow plots are all planted to corn every 6 years, permitting comparison of yields.
   3. All Class I land, the plots planted to continuous corn decreased in yield to 23 bushels per acre by 1920. Rotation plus treatment with manure, lime, and phosphate yielded 100 bushels per acre.

C. A well-chosen rotation keeps the soil in good physical condition.
   1. This allows rapid entry of water from rain.
   2. Runoff and soil erosion are both decreased.
   3. Other values of crop rotation include:
      a. Helping to maintain the supply of organic matter and nitrogen in the soil.
      b. Providing a practical means of utilizing farm manure and fertilizer.
      c. Keeping the soil occupied with crops

d. Improving crop quality

IV. Management of Cultivated Fields

A. Values of cultivation
1. Increases water entry.
2. Improves soil water movement.
3. Increases water storage.

B. Problems of cultivation are primarily those of soil erosion; see Lesson 6 for kinds of erosion.

V. Management of Forest Lands

A. Successful culture of forest land is dependent on an ample supply of moisture.

B. Thinning is one aspect of selective harvesting.

C. Contour planting is necessary in order to prevent erosion and runoff.

VI. Management of Water

A. Ponds and lakes hold or impound water which otherwise would be lost as runoff.

B. Water will benefit rural areas by entering the soil and raising the water table.

C. Silted ponds which dry up provide the farmer with rich, deep fields.

D. Ponds and lakes hold water for irrigation purposes.

Suggestions for Teaching the Lesson

I. Developing the Situation

A. Things to be brought out by the teacher:
1. Total land area in your county and state; total cropland, pastureland, forest land, soil classes in the county, etc. (See the example for Clark County.)
2. Water and soil runoff from 2-acre cornland water sheds. (See masters 3 and 4.)
3. Bring out land classes of importance in the

county.
4. How does crop cover affect soil loss?
5. How does mulch prevent soil loss?
6. What does contouring do?
7. The way we manage soil and water and their products, plants and animals, is important in determining our present and future welfare.

B. Things to be brought out by the class members:
1. Examples of grassland farming, strip cropping, crop rotations, cultivated fields, and forest lands.
2. Means of controlling and collecting water runoff in the community.
3. The crop rotation practices in the community.
4. Maximum amount of loss in the soil after hard, heavy rains in late April or early May.

II. Conclusions

A. Conservation and wise use of soil and moisture on cropland, grassland, and woodlands are keys to keeping our land productive, our people healthy, and our nation strong and beautiful.

B. Losses of water and soil are at their highest during periods of cultivation.

C. Conservation measures such as stabilization of grassland adjacent to cultivated areas help give cultivated lands protection.

D. Crop rotation serves to maintain crop yields, conserve soil and water, improve tilth, maintain organic matter, and keep the soil occupied.

E. Farm ponds and lakes hold water which will benefit our farms by irrigating crops, raising the water table, and reducing erosion from water runoff.

III. Enrichment Activities

A. Field trip on grasslands, crop rotation, strip cropping, forestland, and holding ability of ponds and lakes.

B. Demonstration boxes with cover crop, soil mulch, and contouring to measure loss of soil and water.

C. Demonstrate how rain puddles, compacts, and seals the soil surface.

D. Demonstrate how rain drops cause sand particles to move downhill on sloping land.

IV. Suggested Teaching Materials

A. References for Lesson 7

1. Conserving Soil and Water, Chapter 5, "Improving Land Use."
2. Proceedings, 3rd Kentucky Grasslands Conference, 1972.
3. Profitable Soil Management, Chapters 18 and 19.
4. Soil, 1957 USDA Yearbook, pp. 290-306.
5. Teaching Soil and Water Conservation, USDA, PA 341.
6. Water, 1955 USDA Yearbook, pp. 1, 6, 42, 47, 49.
7. Water Intake by Soil, USDA, Misc. 925.

B. Resource personnel

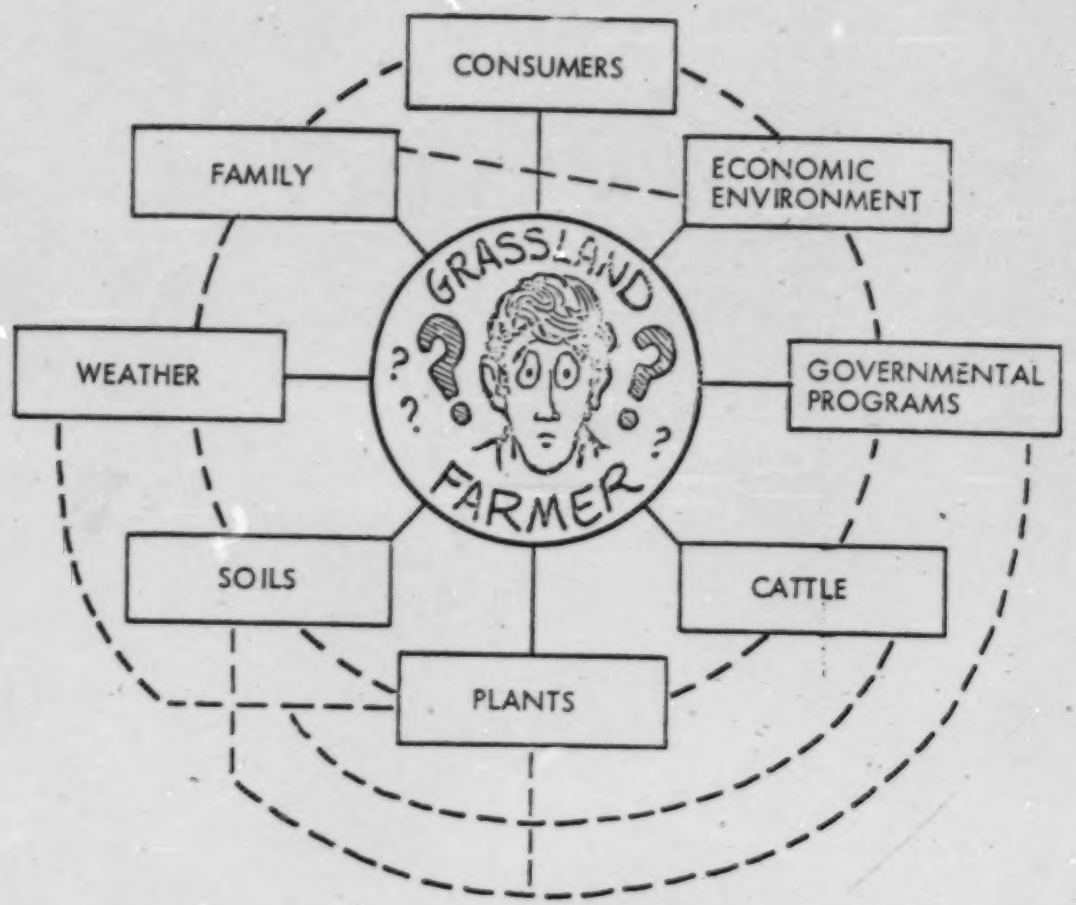
1. County Extension agent
2. SCS personnel or senior Board member of SCS
3. State Forestry Department personnel
4. Young or adult farmer member
5. For specific personnel, see the VoAg Directory of Resource People in Kentucky.

C. Audio-visuals

1. Masters
   - -1 What's a Man to Do?
   - -2 Water Runoff
   - -3 Soil Loss
   - -4 Land Use Pattern
2. Films (Division of Conservation, Frankfort, Kentucky)
   a. "Conserving Our Forests Today," 11 min., Color.
   b. "Let the Little Lake Live," 22 min., Color.
   c. "Planning to Prosper," 20 min., Color.

d. "Soil Conservation," 20 min., Color.
e. "Valley of Still Waters," 22 min., Color.

FACTORS WHICH THE GRASSLAND
FARMER FACES IN MAKING DECISIONS

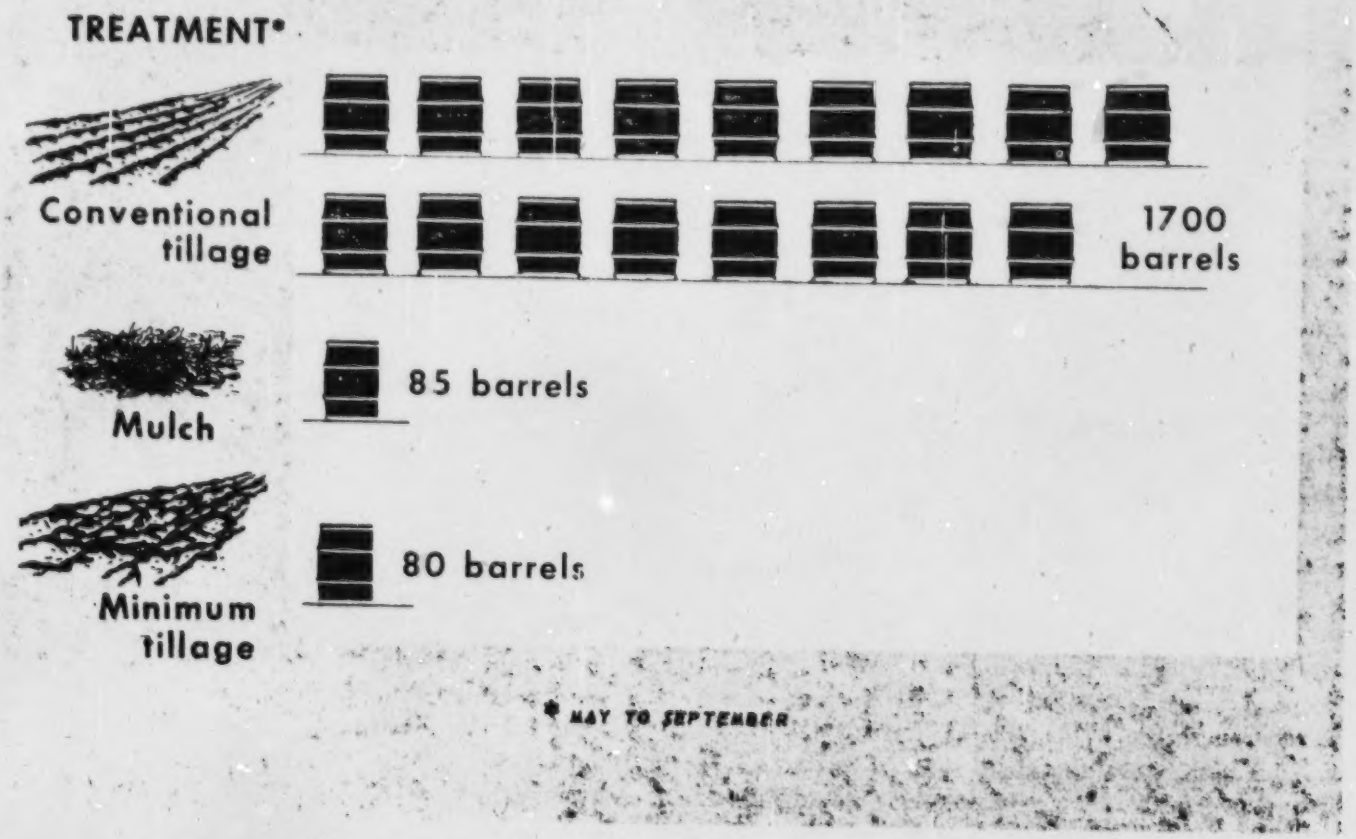


WHAT'S A MAN TO DO?

SOURCE: University of Kentucky 102-7-1

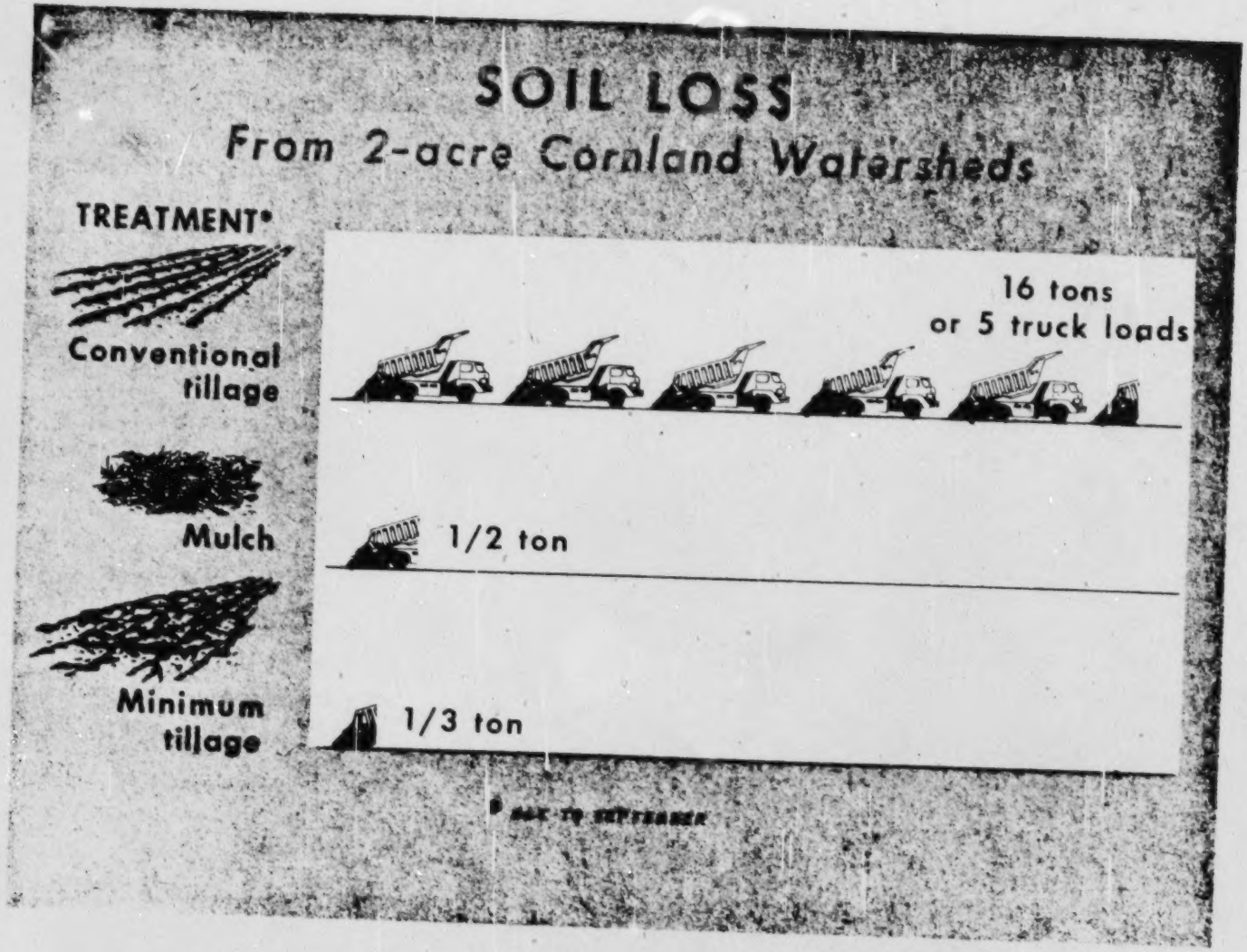
WATER RUNOFF

From 2-acre Cornland Watersheds



Source: USDA

102-7-2



Source: [redacted]

102-7-3

Worksheet

RURAL LAND USE PATTERN

_____

Farm

_____

Legal description
of land

1. Total acres _____ A.

2. Non-agricultural uses
   Home site _____ A
   Roads _____ A.
   Water area _____ A.
   Other _____ A.

   Total _____ A

3. Remainder for agricultural use _____ A.

	Present use	Change needed
Class I	_____ A.	
" II2	_____ A.	
" III	_____ A.	
" IV	_____ A.	
" V	_____ A.	
" VI	_____ A.	
" VII	_____ A.	

102-7-4

Lesson 8

SOIL AND WATER FOR URBAN USE

Objective -- To develop the effective ability of urban dwellers to manage our soil and water for urban use.

Problem and Analysis -- How should we manage soil and water for urban use?

-Soil and water problems of urban areas
-Practices for residential tracts
-Practices for construction sites
-Practices for streets and parks
-Protecting water sheds
-Need for land-use plans

Content

Introduction

History may well record that the beginning of the decade of the seventies marked the turning point in man's use and abuse of the precious planet of which he is both ward and guardian.

Public policy decisions affecting the environment are not all made in Washington. All over America, change is taking place - change that challenges the pessimistic view that man is helpless to control the technological forces he has set in motion; change growing out of a new ecological perspective, translating a new environmental ethic into environmental action.

People all over the country are insisting that we abandon the psychology of the blind bulldozer, that we refrain from paving over the whole world, that we stop polluting the air and the water and the earth. They are taking their cases to the courts. Their voices are being heard in corporate board rooms and by government officials and legislators at every level.

People are becoming more aware of the construction problems that we have faced in our suburban areas. Many local

governments and development firms have learned important lessons in working with nature.

Each year approximately 420,000 acres of cropland are developed for urban uses. New priorities and problems confront us; new issues and goals emerge. There is more to be done by each of us; more to be done together. Can we plan land use for whole regions as well as for ranches and farms?

Can we strive for an end to pollution as we've fought against gullies and floods?

Can we build up the ranks of soil stewards as our cities and suburbs expand?

Can we acknowledge that rights of ownership must be tempered by the common good and insist that resources serve people? Can we do a better job in managing our soil and water for urban use?

I. Soil and Water Problems of Urban Areas

A. Increased runoff
   1. When native cover is stripped away and replaced by roofs and paving, runoff water behaves in new and sometimes violent ways.
   2. Runoff from built-up areas may be 2 to 10 times as great as from the same land in farm or forest.
   3. Runoff water must be disposed of with the least damage to property owners.

B. Soil erosion occurs wherever water hits bare ground
   1. New homes have much bare ground around them.
   2. There may be critical areas--shade spots, steep slopes, or drainageways--where grass refuses to grow.
   3. The principle of preventing erosion is to have the grounds as completely covered as possible with growing vegetation.

C. Floods and sedimentation
   1. Increased frequency of flooding occurs as building progresses.

2. During construction periods, runoff water carries heavy loads of soil washed from exposed building sites.
3. Sediment is deposited in lawns, basements, culverts, stream beds, and reservoirs.

II. Practices for Residential Tracts

A. Control abnormal runoff of water
1. Keep water spread out and moving slowly enough that it does not scour the soil.
2. Divert water from areas it could damage.
3. Make water flow on erosion-resistant surfaces, like dense sod or concrete.

B. Other methods that may be used are grading, diversions, grass waterways, drainage, tiles, ponds, terraces, and strip cropping.

III. Practices for Construction Sites

A. Large housing developments and major construction jobs may keep the disturbed area bare and vulnerable from 1 to 3 years. To reduce problems:
1. Keep the site covered.
2. Control velocity of runoff.
3. Dams and basins can be built to trap sediment on construction areas.

B. Some practices used are hydroseeding, storm drainage, debris basins, jute netting, straw mulch, and baffles.

IV. Practices for Streets and Parks

A. Good planning of the layout of areas for development can minimize runoff and erosion by taking into account the "lay of the land."

B. Unpaved road ditches and gutters need to be shaped and sodded to serve as grass waterways.

C. Wise choice of sites and good planning can avoid many of the erosion and flooding problems.

D. Small natural areas for study and enjoyment by

the community may be preserved and also help control erosion.

E. Stabilizing streambanks is very important in handling increasing runoff.

V. Protecting Watersheds

A. Watershed is all the area from which water drains to a particular point of interest.

B. Larger watershed problems usually can be dealt with only by cooperative action of the landholders in the watershed area.

C. The more difficult situations may require major structural works, such as floodwater-retarding dams, diversions, drainage ditches, sediment basins, or extensive planting or mulching of of eroding areas.

VI. Need for Land Use Plans

A. A positive program for better land use calls for the joint use of measures to prevent undesired land-use practices and measures to direct nonagricultural uses to those areas which have the highest social utility for these areas.

B. This type of program will not first happen; it must be planned. This process calls for more emphasis on metropolitan and regional planning.

C. This program requires broad recognition of the social responsibility our various local units of government have for giving guidance and directions to the use we make of our land.

Suggestions for Teaching the Lesson

I. Developing the Situation

A. Things to be brought out by the teacher:

1. The process of reshaping land for urban use alters soil in many ways, often with drastic effects on drainage, runoff, and streamflow.

2. There is a big push on for non-farm use of land. (See master 1.)
3. Two thirds of the American population live in metropolitan areas. Three fourths of the American population live in incorporated settlements of 2,500 or more. (See master 4, urban sprawl.)
4. Many building construction and zoning practices have contributed to the deterioration of the environment. In the process of building and construction, the land is often stripped before construction begins. This causes severe erosion as well as the destruction of tree and plant cover.
5. Some construction has taken place on watersheds and other areas where water was once able to soak into the soil, thus contributing to heavier runoff, floods, and eventual shortages of water.
6. Each year 420,000 acres of cropland are developed for urban uses. (See master 2.) Plans must be made in more detail in order to manage our soil and water in our urban areas. (See masters 5 and 6.)

B. Things to be brought out by the class members:
1. Problems they have with runoff water at home.
2. Determine who they think is responsible for the care of any tract of land, whether owned, leased, or rented.
3. Some problems of urban areas (malls, subdivision, schools, etc.) as they relate to soil and water.
4. Views on land-use planning.
5. Solutions that have worked for them in controlling soil and water problems around their homestead.

II. Conclusions

A. There are several land-use tools that may be used to help solve soil and water problems of urban areas. (See master 7.)

B. A good hard scientific look at the soil before you buy or build may save you a great deal of

grief.

C. Impoundments and other means used from the time ground is broken until the project is completed and the surface again stabilized, can prevent increased runoff, soil erosion, floods, and sedimentation.

D. Each builder, developer, or contractor, must make water pollution control from surface runoff a regular part of every project as a normal cost of the total operation, just like labor, materials, etc.

E. We must have a clearly outlined and simply stated land use plan that a community or local government intends to follow. (See master 8.)

III. Enrichment Activities

A. Discussion of a sound land-use plan by a planning and zoning member, SCS, county extension worker, builder, school official, businessman, and a couple of members of the class.

B. Field trip around the community pointing out good and poor points on soil and water management, such as erosion and flooding around new homes, schools, filling stations, motels, etc.

C. Make maps of class members' homes showing natural surface water courses.

D. Observe the natural watershed areas of the community.

E. Examine commercial and government publications on land drainage.

IV. Suggested Teaching Materials

A. References for Lesson 8

1. Conservation Goes to Town, Reprint from Soil Conservation SCS-USDA.
2. Controlling Erosion on Construction Sites, USDA-347.
3. Know the Soil You Build On, USDA-SCS,

Bulletin 320.

4. Land - 1958 Yearbook of Agriculture, pp. 474-479.
5. Land Use, Washington State University, AgEd Environmental Education Series 73-3D.
6. National Land Use Policy - Conference SCSA, November 1972, Des Moines, Iowa.
7. Profitable Soil Management, Chapter 15.
8. Soil and Water Conservation in Suburbia, Reprint from Soil Conservation, USDA, SCS.
9. Soil Conservation at Home, USDA,SCS, Bulletin 244.

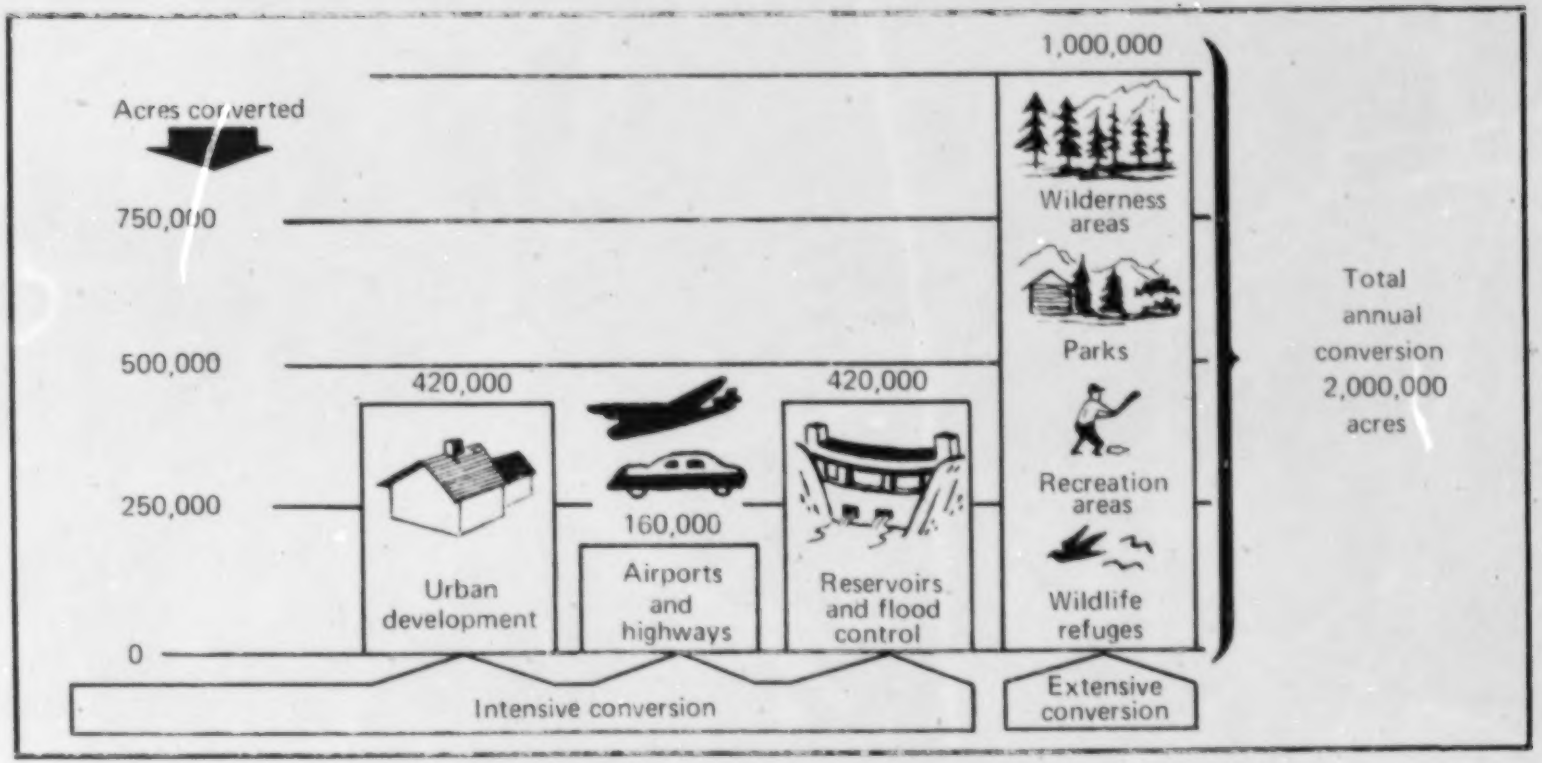
B. Resource personnel
   1. Builders, planning and zoning member, SCS, county Extension personnel, school official, businessman and State Forestry Service
   2. For specific personnel, see VoAg Directory of Resource People in Kentucky.

C. Audio-visuals
   1. Masters
      -1 The Big Push
      -2 Annual Conversion of Rural Land in the U.S. to Nonagricultural Uses
      -3 Rural Land Shifted Annually to Other Uses, 1959-69
      -4 Urban Sprawl
      -5 1990
      -6 Types of Problems Caused by Urban Sprawl
      -7 Land Use Tools Available
      -8 One Chance to Plan
   2. Films (available for loan from Division of Conservation, Frankfort, Kentucky)
      a. "Citizen Makes a Decision," 20 min., Color.
      b. "Environment," 29 min., Color.
      c. "Mud," 20 min.,Color.
      d. "Urban Sprawl as Planned Growth," 22 min., Color.

PAGE 137 OF THIS DOCUMENT WAS REMOVED PRIOR TO ITS BEING SUBMITTED TO THE ERIC DOCUMENT REPRODUCTION SERVICE BECAUSE IT WOULD NOT REPRODUCE IN MICROFICHE.

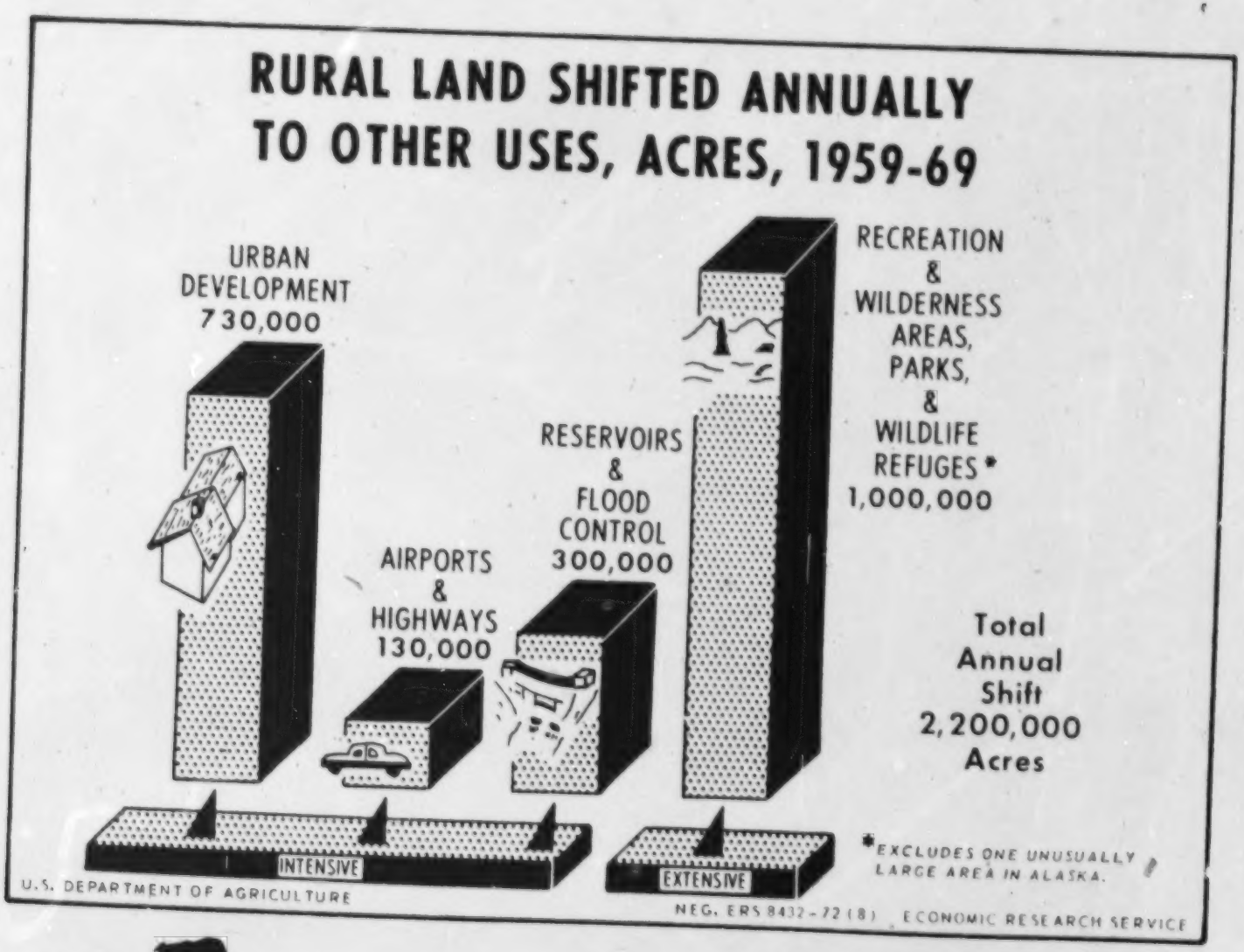
Source: Soil Conservation Service 102-8-1

ANNUAL CONVERSION OF RURAL LAND
IN THE UNITED STATES
TO NONAGRICULTURAL USES



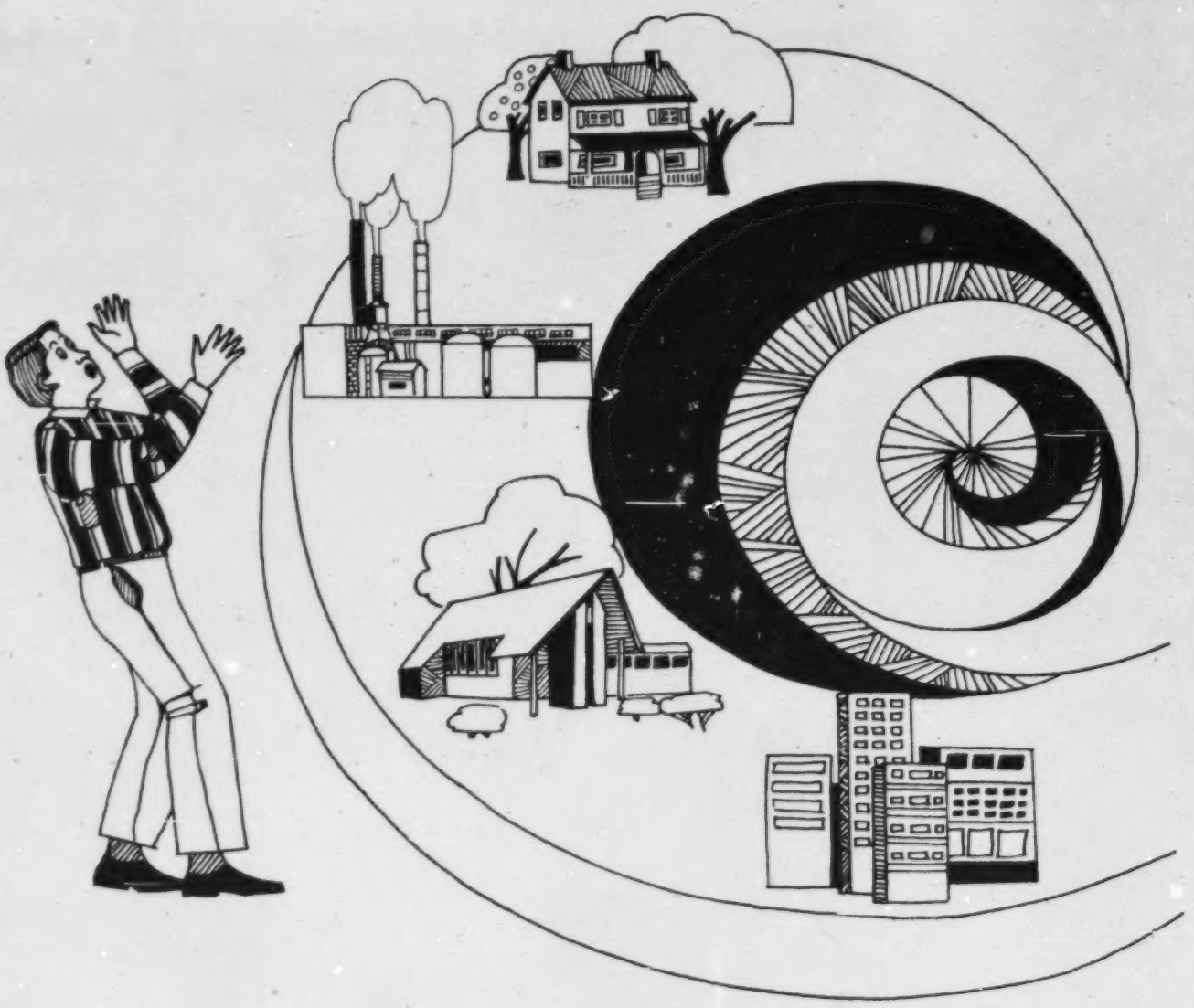
Source: Environmental Quality, The First Annual Report of the Council on Environmental Quality, 1970.

102-8-2



Source: 1972 Handbook of Agricultural Charts, p. 23, USDA. 102-8-3

URBAN SPRAWL



Source: VoAq Visuals, New Holland Division of Sperry Rand Corp.

1990

70 Million more people in the U.S.

Some farmers - Bonanza

1. Price Advance or even sky-rocketing land values.

Other farmers - Disaster

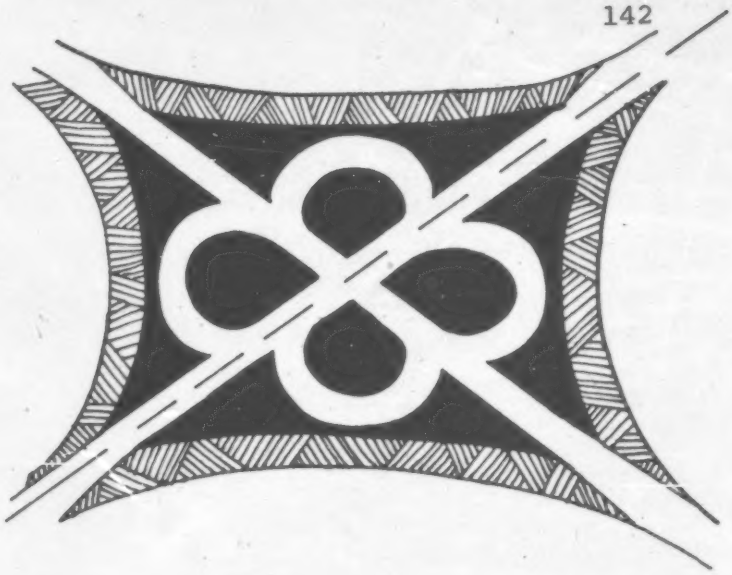
1. Rising Property Taxes

2. Break up of prime units

Source: VoAg Visuals by New Holland Division of Sperry Rand Corp.

102-8-5

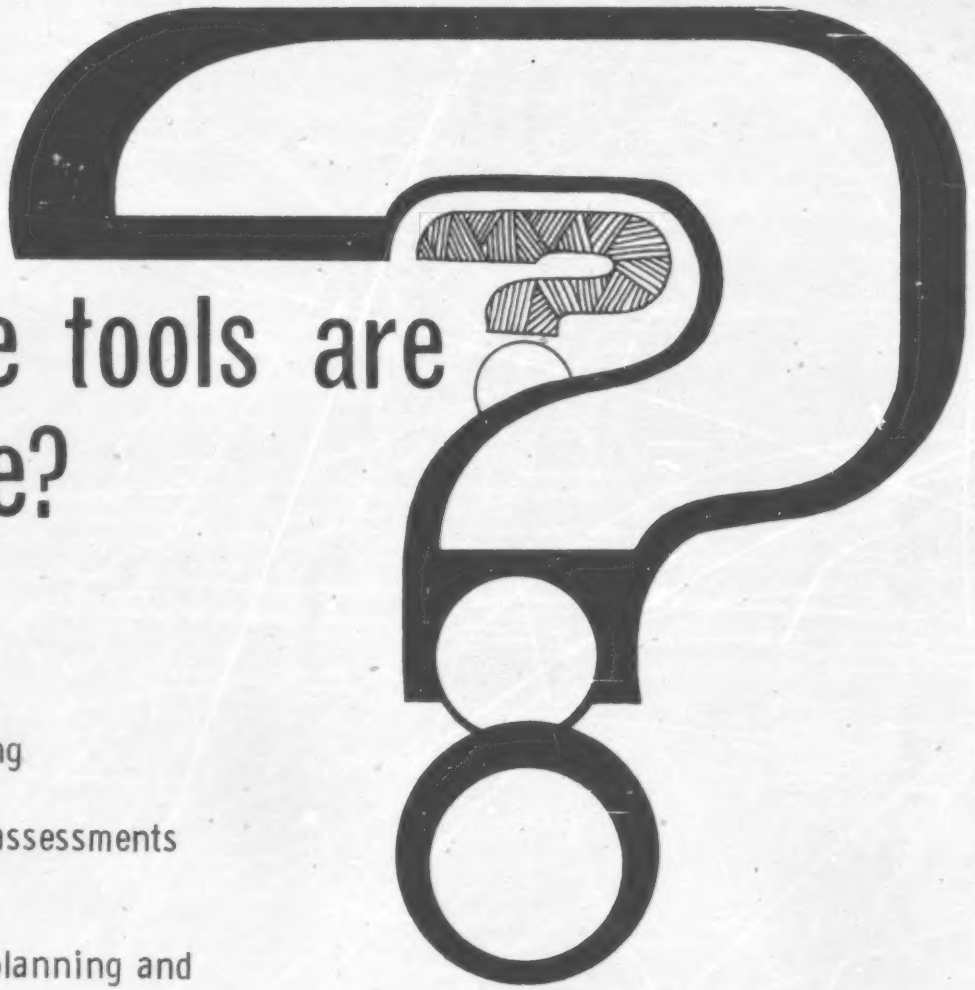
What types of problems are caused by urban sprawl?



1. Junkyards and other undesirable businesses near homes
2. Low taxation for demanded services
3. Lower water table
4. Neglected soil erosion control
5. Nuisance ordinances
6. Pollution of streams and wells

Source: VoAg Visuals, New Holland Division of Sperry Rand Corp.

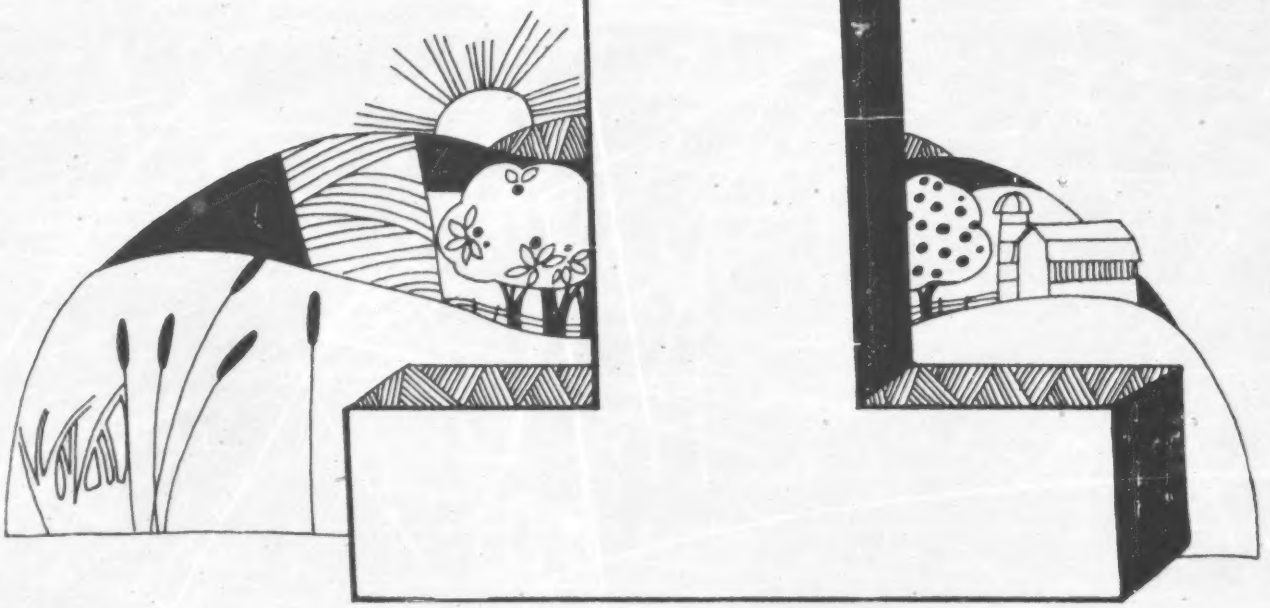
What land use tools are available?



1. Soil Surveys
2. County Zoning
3. Preferential assessments to farmland
4. Careful site planning and development

Source: VoAg Visuals, New Holland Division of Sperry Rand Corp.

WE HAVE 1 CHANCE



TO PLAN OUR LAND USE PROGRAM

Source: VoAg Visuals, New Holland Division of Sperry Rand Corp.

APPENDIX

MY TEACHING PLAN FOR THIS COURSE

Why I am teaching this course (major learnings or outcomes expected)

_____

_____

_____

_____

_____

_____

ARRANGEMENTS FOR THE COURSE

Session No.	Date	Topic	Clock Hours

This page is for your convenience in planning and rearranging the content of this course to meet local needs and interests. Plan the course as it will be taught in the local school, showing the dates, class session number, topics, and the time in hours allocated to each topic.

TOPIC PLANNING FOR THIS COURSE

Name of Course _____

Name of Topic _____

Number of Class Meetings Allotted for this Topic _____

Teaching Objectives: (Learnings or outcomes for those enrolled)

Major Phases of the Topic: (Problems, jobs, areas, skills, key points, understandings, etc.)

Learning Activities: (Field trips, completing summary forms, panel discussions, demonstrations, etc.)

Teaching Materials Needed: (From resource material list or file)

RESOURCE MATERIALS FOR TEACHING

Unit _____ Lesson _____

Reference Books	Date Used	File Location

Other References: Bulletins, Magazines, Etc.

Audio-Visuals: Slides, Filmstrips, Motion Pictures

Magnetic, Flannel, and Bulletin Boards

Charts, Maps, Posters

Transparencies

Specimens, Models, Mounts

Human and Community Resources

Please complete and return to:
Maynard J. Iverson
7 Dickey Hall
University of Kentucky
Lexington, Kentucky 40506

ADULT INSTRUCTIONAL UNIT EVALUATION

-- A Questionnaire for Kentucky VoAg Teachers of Adults

PART I -- GENERAL INFORMATION

How many years of teaching experience do you have? _____

How many years have you taught adults in agriculture? _____

How long has it been since you have taken your last college classwork in agriculture_____; in education _____; (undergraduate, graduate, or non-credit course)? _____

What is the highest degree you hold? _____

How many teachers are in your department?_____

What age level students do you teach? (✓ one)
a) ____high school and adult b)_____adult only

How many other units from the University of Kentucky have you used in your teaching during the past few years?_____

PART II -- UNIT INFORMATION

NAME OF UNIT EVALUATED:_____

TYPE OF CLIENTELE TAUGHT: _____Adult Farmer ____Young Farmer
_____Other Adults (please specify)_____

Average number attending class _____

Was the interest level _____high? ____moderate? _____low?

How many lessons did you use?_____ How many class periods?_____

Indicate any lesson you added or deleted_____

_____

_____

_____

Directions: Place a check mark (✓) in the appropriate left hand column to rate the following components of the unit based on your own observations. A ranking of 5 represents an excellent rating decreasing to a rank of 1 for poor. For the open-ended questions please write on the back if additional space is needed.

Unit Design

5	4	3	2	1	
					General arrangement of parts
					Appropriateness of format for teaching adults
					Length of the unit
					Usefulness of suggestions for using the unit
					Number of lessons
					Order of lessons

Specific comments:_____

_____

PLEASE CONTINUE ON NEXT PAGE

Objectives in the Unit

5 4 3 2 1

_____ Clearly stated
_____ Reasonable to reach in the allotted time
_____ Relevant to needs of the adult learner
Specific comments: _____

_____

Technical Content

5 4 3 2 1

_____ Usefulness of introductory material
_____ Sufficiently detailed for direct use in class
_____ Related to objectives
_____ Divided into appropriate problem areas
_____ Up-to-date
_____ Accuracy
_____ Reasonably complete
Specific comments: _____

_____

Suggestions for Teaching the Lessons

5 4 3 2 1

_____ Appropriate information for the teacher to bring out
_____ Appropriate items to be secured from class members
_____ Suitable conclusions
_____ Suitability of enrichment activities
Specific comments: _____

_____

Resources and Teaching Aids in the Unit

5 4 3 2 1

_____ Up-to-date
_____ Accessibility to the teacher
_____ Relevance to the unit
_____ Adaptability to the teaching plan
Specific comments: _____

_____

With what parts of the unit do you feel you need additional help?

____ None of them
____ Objectives
____ Content
____ Course organization and planning
____ References
____ Resources and teaching materials
____ Teaching methods
____ Other (Specify) _____

PART III -- GENERAL REACTION

Please indicate any other strengths and weaknesses that you have observed in the unit and any suggestions for improvement, revision, and/or implementation (use the back of this sheet if needed).